MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for April, 1901, is based on reports from about 3,100 stations furnished by employees and voluntary observers, classified as follows: regular stations of the Weather Bureau, 159; West Indian service stations, 13; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,562; Army post hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Railway Company, 96; Canadian Meteorological Service, 32; Mexican Telegraph Service, 20; Mexican voluntary stations, 7; Mexican Telegraph Company, 3; Costa Rica Service, 7. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Commander Chapman C. Todd, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San Jose, Costa Rica; Captain François S. Chaves, Director of the Meteorological Observatory, Ponta Delgada, St. Michaels, Azores, and W. M. Shaw, Esq., Secretary, Meteorological Office, London. Rev. Josef Algue, S. J., Director, Phillipine Weather Service.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′ or 10^h 30^m west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now always reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

Forecasts of wind and weather for the first three days out of steamers bound east from United States ports were made daily during the month and published on the weather maps issued in Washington, Baltimore, New York, and Boston.

Three important disturbances appeared over the United States during the month. The first of these occupied the west Gulf coast on the morning of the 1st, and moved thence to the middle Atlantic and New England coasts by the 4th, its passage being attended on the 3d by gales of 40 to 50 miles an hour from Hatteras to Eastport. The second traversed the United States from the north Pacific to the middle Atlantic coasts from the 1st to the 6th; thunderstorms occurred from Texas to the Ohio Valley, and northeast shifting to northwest gales over the Great Lakes, during the 5th; high easterly shifting to north and northwest winds prevailed on the middle Atlantic and New England coasts during the 6th and 7th. The third assumed definite form over Texas on the morning of the 17th, moved thence eastward over the Gulf States during the 18th, recurved northeastward over the South Atlantic States during the 19th, reached the Middle Atlantic States on the 20th, from which region it drifted westward over the Ohio Valley and dissipated. The rain which attended this disturbance was heavy, and in the Ohio Valley the rain which began on the 18th and continued through the 21st resulted in destructive floods. A detailed description of these floods will be found under the heading Rivers and Floods. The character and value of the warnings which were issued by the Weather Bureau in connection with the floods are indicated by the following editorial in the St. Louis, Mo., Republic of May 7, 1901:

HONOR IS DUE.

Hereafter it may be assumed that the Weather Bureau man will be held in high esteem throughout the Ohio Valley. During the flood period now gradually closing millions of dollars have been saved through the warnings that have been given by this branch of the Government service.

It is so seldom that the Weather Bureau receives credit for correct forecasts that the widespread commendation for the timely warnings that have been given the people of the inundated section is notable. So accustomed have the people become to observing the mistakes of the Weather Bureau that the almost universal regard which the public really feels for the service is seemingly hid beneath showers of good natured banter.

That any talk of abolishing the service should ever have been seriously considered seems utterly preposterous. The actual amount saved to the people through the warnings given in the great flood is a thousand times more than the annual cost of the service. All praise to a department that is too often slighted.

From the 12th to the 16th heavy snowstorms occurred in the middle Rocky Mountain districts, and from the 19th to the 23d snow fell in the mountains of eastern Tennessee, eastern Kentucky, Virginia, West Virginia, and Pennsylvania.

Frequent damaging frosts in the North Pacific States, were, as a rule, accurately forecast. In the central and northern counties of California fruit was damaged by cold, dry weather.

CHICAGO FORECAST DISTRICT.

Advisory messages were sent to open ports on the upper Lakes on the 1st and 4th, and to Lake Michigan and Lake Huron ports on the 16th, to the effect that the wind would become brisk to high. On the 20th, 21st, and 22d warnings for high north to northeast winds were issued in connection with a condition seemingly dangerous to navigation, the condition being a storm of steep gradient entering from the British Northwest, while an area of high pressure and cold air overlay the Lake Superior region, and at the same time a severe storm was central on the middle Atlantic coast with a steep gradient extending northwest nearly to the lower lakes. Fresh to brisk northeast winds obtained generally over the upper lakes, and high northeast over Lake Michigan.

In anticipation of the unseasonably cool weather which overspread the district from the 16th to 19th, frost warnings were issued to such sections as would be liable to suffer injury by heavy frost or freezing weather.—*F. J. Walz, Forecast Official.*

SAN FRANCISCO FORECAST DISTRICT.

The month was as a whole unusually dry. This dry condition, it is believed, was largely brought about by the prevalence of an area of high pressure from British Columbia to Alberta.

Southeast storm warnings were displayed along the coast early on the morning of the 29th. While not technically justified at the most southern points of display, it is believed that reports from incoming vessels will show that the conditions at sea were such as accompany a moderate southeaster.—*A. G. McAdie, Forecast Official.*

PORTLAND, OREG., FORECAST DISTRICT.

The month was unusually cool and damaging frosts occurred frequently. The frosts were as a rule accurately forecast. No damaging storms occurred inland, but several were reported along the coast, the more severe of which took place on the 1st and 28th. Storm warnings were ordered hoisted at stations nearest the coast in advance of both of these storms, and information of their character sent to inland points.—*E. A. Beals, Forecast Official.*

HAVANA, CUBA, FORECAST DISTRICT.

But one warning was issued. This warning was received from Washington and was worded as follows:

WASHINGTON, D. C., *April* 18, 1901, 11 *a. m.*

Storm center near Mobile moving east; Strong east to southeast winds will shift to-night to northwest on north Cuban coast with lower temperature.

This warning was sent to all Cuban north coast stations and to Santiago, and was very fully disseminated. It was fully verified and much appreciated, for, although the registered wind velocity did not exceed 28 miles an hour, very high seas continued during the 19th, 20th, and 21st. The forecast was highly commented on for its accuracy by the governor general, the captain of the port, and a number of prominent army officers at the governor general palace, the governor general having been prevented from taking a trip in his steam yacht to Miami en route to Washington by the high seas running. A number of expressions of the value of the warning were received from agents of steamship companies.—*W. B. Stockman, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	2, a. m.	32	107	3, p. m.	37	87	1,300	1.5	867	36.1
II	4, a. m.	38	123	6, p. m.	39	95	1,550	2.5	620	25.8
III	5, p. m.	50	97	13, p. m.	41	70	3,150	5.0*	630	26.2
	6, p. m.	40	124				1,650	2.5†	660	27.5
IV	12, a. m.	53	122	13, p. m.	50	97	875	1.5	583	24.3
V	25, p. m.	40	124	29, p. m.	39	75	3,075	4.0	769	32.0
Sums							11,600	17.0	4,129	171.9
Mean of 6 paths							1,933		688	28.7
Mean of 17 days									682	28.4
Low areas.										
I	1, a. m.	53	122	4, a. m.	50	100	1,400	2.0*	700	29.2
II	3, p. m.	41	105	7, a. m.	41	70	2,950	3.5	843	35.1
				6, p. m.	37	75	2,900	2.7	1,074	44.8
III	4, a. m.	49	123	7, a. m.	53	105	1,075	2.0*	538	22.4
IV	9, p. m.	32	107	13, a. m.	37	90	1,465	3.5	419	17.5
				16, p. m.	32	65	3,900	6.0*	650	27.1
V	15, p. m.	38	100	17, a. m.	48	85	1,100	1.5	733	30.5
VI	16, p. m.	32	107	22, a. m	39	85	2,750	5.5	500	20.8
VII	22, a. m.	49	123	24, a. m.	53	105	925	2.0	462	19.2
VIII	22, p. m.	32	86	25, a. m.	41	70	1,250	2.5	500	20.8
Sums							19,715	31.2	6,419	267.4
Mean of 10 paths							1,972		642	26.7
Mean of 31.2 days									632	26.3

* Stationary for 1 day. † Stationary for 3 days.

RIVERS AND FLOODS.

Two floods in the Ohio River, one of them almost unprecedented for the season, were the principal occurrences of interest during the month. The first rise, which resulted from heavy rains over the watersheds and valleys of the Allegheny and Monongahela rivers, began on the 3d, and on the 8th the water reached the danger line at Pittsburg, Pa. The decline of this flood at Pittsburg was as rapid as had been its rise, and the danger stage was maintained less than a day. As the crest passed down the river, high readings were reported from all points between Pittsburg, Pa., and Cairo, Ill., but no damage resulted, and the danger line was not reached, except at the first named place. Concerning this flood the Weather Bureau Official at Pittsburg reports as follows:

PITTSBURG, PA., APRIL 23, 1901.

On the morning of the 3d instant a very heavy snowfall, from 12 to 15 inches, seriously crippled the telegraph and telephone communications, and practically no reports were received on the 3d, very few on the 4th, and they were generally delayed and unsatisfactory until the morning of the 7th instant, when Freeport and Lock No. 4, the two most important stations, were still missing. Owing to this state of affairs it was very difficult to keep track of the upper river conditions, and I had to surmise what the precipitation and fluctuations were on the Allegheny and Monongahela rivers for a distance of over 100 miles from Pittsburg. Meanwhile the rivers continued to rise slowly at Pittsburg, and on the morning of the 7th instant, reached a stage of 20.7 feet, 1.3 feet below the danger line. Considering the reports of the

small rises from the upper river stations of from 1.0 to 5.0 feet during the past 24 hours, but still unacquainted with the conditions prevailing over the lower 80 miles of each river, I concluded that the danger line might be reached or exceeded at Pittsburg, and consequently sent out warnings to the effect that from 23 to 25 feet might be expected by the morning of the 8th instant. The river reached 22.1 feet at Pittsburg on the Monongahela River, and 23 feet at Herrs Island Dam on the Allegheny River, at the foot of Twenty-second street, Pittsburg, on the evening of the 7th instant. While I expected the maximum to be reached during the night of the 7th and 8th, it was evident from succeeding events that the crest of the rise was closer than I was lead to surmise in the absence of definite information from the lower stations on both rivers.

While the central and lower reaches of the river were still swollen, excessive rains, augmented by melting snow on the mountains of Pennsylvania, set in over the watersheds of its upper tributaries, and by the morning of the 20th the waters were again rising rapidly at Pittsburg. Prompt action was taken by the official in charge at Pittsburg, who gave warning to all interests liable to be affected in his district, and telegrams were at once sent from Washington to all threatened points on the river. On the 20th the following special flood bulletin was issued, and on the 21st and 22d similar bulletins were issued and widely disseminated by telegraph and through the press:

SPECIAL FLOOD BULLETIN.

The excessive rains of the past twenty-four to thirty-six hours over the upper Ohio watershed have caused a very rapid and dangerous rise in the upper Ohio River and its tributaries. In anticipation of a flood of decided proportions warnings were issued this morning of a 30-foot stage at Pittsburg during to-night, and danger-line stages, or over, below Pittsburg as far as Portsmouth, Ohio.

At 7 p. m. the stage of water at Pittsburg was 24.6 feet, 2.6 feet above the danger line, a rise of 7.2 feet since 8 a. m., and rising one-half foot an hour; at Parkersburg the stage was 34.8 feet, a rise of 7 feet since 8 a. m., and 1.2 feet below the danger line and still rising; at Cincinnati the stage was 35.8 feet, a rise of 4.7 feet since 8 a. m., and rising, but still 15 feet below the danger line.

As it is still raining over the upper Ohio Valley it is impossible to-night to venture a definite forecast of the exact crest of the flood wave. It will, however, move rapidly down the Ohio River, and stages above the danger lines will no doubt be reached as far as Cincinnati by Sunday night or Monday.

Flood warnings have been widely distributed, particularly in the vicinity of Pittsburg, and reports received to-night indicate that a great amount of portable property has been removed to places of security.

Special reports have been called for from the flood districts on Sunday morning, when further information will be given and additional warnings issued if necessary. The situation below Cincinnati will be carefully watched and prompt and timely warnings will be issued if necessary.

The down-stream progress of this flood and the resulting damages are best described by the Weather Bureau officials in charge at Pittsburg, Pa., Parkersburg, W. Va., Cincinnati, Ohio, Louisville, Ky., Evansville, Ind., and Cairo, Ill., whose special reports follow in the order named:

PITTSBURG, PA., APRIL 24, 1901.

The position and movement of the southern storm on the mornings of the 18th and 19th, in my opinion, justified me in sending out preliminary advices to river interests in this locality to be on the lookout and keep in close touch with this office for a day or two, as heavy rains were indicated which might result in high waters. Up to noon of the 19th instant there had fallen over the Allegheny and Monongahela rivers an average of nearly an inch of rain. Shortly after midday it began raining very heavily at Pittsburg, and at 8 a. m. of the 20th from 1.00 to 2.00 inches had been added over about 150 miles of the lower portions of the Allegheny and Monongahela rivers and tributaries; this rain also extending for a long distance down the Ohio River. The stage of water was then 17.4 feet, and rising at the rate of 1 foot an hour. Deeming it best not to waste an hour for complete reports from the upper streams, I concluded from the present river conditions and the precipitation at Pittsburg and unofficial reports from the surrounding country, that a flood was imminent, and 30 feet would probably be reached in the three rivers at Pittsburg, and accordingly sent out warnings through the departments of police of Pittsburg and Allegheny, and by telephone and telegraph to the neighboring towns and lower river points. Subsequent reports from the upper river stations seemed to justify the original prediction for 30 feet. The rivers continued to rise until early on the morning of the 21st, when they became stationary, remaining so until 10 a. m., when they began falling. The maximum stages were as follows: on the Market street gage on the Monongahela River 27.5 feet, on the Allegheny River the gage at Herrs Island Dam (foot of Twenty-second street, Pittsburg), 28.6 feet.

While the rivers at Pittsburg began falling on the 21st, and continued to do so, the upper Allegheny River rose until late on the 22d. Later reports convinced me that much of the precipitation reported from the northern stations, that is, along the Allegheny River on the evening of the 20th, resulted from melting snow on the hills, which no doubt caused the rise in that river. Had it not been for this fact it is altogether probable that the forecast for 30 feet would have been fully verified, and perhaps exceeded. No reports of snow were made by the river observers to this office, which is doubtless due to the fact that the precipitation in the valley was rain, while on the hills along the Allegheny River it was snow.

Owing to the warning sent out from this office the manufacturing and business interests in the low sections were enabled to make preparations for the flood and consequently no serious losses were suffered by them. Not the least costly feature of this flood is the fact that thousands of working people were temporarily thrown out of employment, scores of mills and workshops situated along the three rivers being obliged to suspend. The losses sustained by the owners of these establishments through damage by water was very great, and it was shared by their employees who endured a period of enforced idleness.

PARKERSBURG, W. VA., APRIL 24, 1901.

Based on the reports of the 20th, and a message from Pittsburg that the crest might reach 30 feet, Wheeling was at once advised that extreme high water of not over 46 feet might be expected Sunday night, and Parkersburg that from 37 to 40 feet might be looked for Sunday morning, and about 45 feet Monday night.

From special reports received about 3 p. m., and the fact that heavy snow was falling practically all over the valley and tributaries, a prediction was made that conditions seemed to warrant a stage in excess of the flood of 1898. Bulletins were thereafter issued from time to time covering the situation.

CINCINNATI, OHIO, MAY 6, 1901.

The maximum stages reached at the different points in this district were: 53 feet, 7 a. m. 24th, at Point Pleasant; 57.4 feet, 7 p. m. 24th, at Huntington; 59.1 feet, 4 a. m. 25th, at Catlettsburg; 58.4 feet, 5 p. m. 25th, at Portsmouth; and 59.7 feet, 9 p m. 26th, at Cincinnati. The stage remained stationary for about 10 hours at Point Pleasant, 19 hours at Huntington, 13 hours at Catlettsburg, 10 hours at Portsmouth, and 17 hours at Cincinnati.

Timely warnings both as to the danger-line stage, and later on as to the probable limit of the rise, were issued. On Saturday morning, April 20, the warning was issued that the river would exceed the danger line at Cincinnati by noon Monday. Referring to this warning, the following is from the Commercial Tribune of the 23d:

"Forecaster Bassler's calculation that the rise in the river would reach the danger-line or fifty-foot stage by noon Monday, fairly hit the mark, to all intents and purposes. The slight decrease in the rate of rise made the swelling waters lag just a little, and it was shortly before 2 o'clock in the afternoon when the danger line was actually touched. The brief delay was welcome enough to the business men who had not quite completed the removal of their goods lying in reach of the flood at that mark. All were thankful for the timely warnings given by the Weather Office, and the general comment on Mr. Bassler's close estimate, given out a day and a half before, was that he certainly knows the ways and doings of the big river like a book."

On Saturday morning, April 20, the warning was sent to Point Pleasant that the river would pass the danger line at that place during Saturday night.

Later on Saturday, the 20th, warnings were sent to Portsmouth, Catlettsburg, and Huntington that the river would pass the danger line at those stations during Sunday. These warnings were practically verified and their value is indicated by the statements of the special observers embodied in this report. Daily information was sent to points within the district.

In some respects the recent overflow resembled that of February, 1897, when the local stage reached a height of 61.2 feet; more especially was this the case in the simultaneous rise at all points above. In the matter of damages no figures are available that will express the loss sustained with any degree of exactness. Perhaps the greatest, if indirect, loss to the city by these natural overflows of the river, is brought about by the sensational headlines in our newspapers, which are seldom substantiated by the facts, but which give the outside world the idea of a distressful state of affairs. Great damage in various ways is of course always done to the traffic interests, the manufacturing interests, the wholesale and commission houses, and to homes and tenements along the river bottoms.

Seven of the railway companies entering the city were more or less affected by the recent flood.

Steamboat interests suffered some expense by reason of boats not being able to reach their usual wharfs.

Merchants in the bottoms were prepared and suffered no loss through damaged goods.

The coal trade sustained a merely nominal loss, no floating property having been destroyed.

As to the effect of the flood in the larger towns above, reports from substation observers are herewith given.

The following is taken from the official report of the special river observer at Portsmouth, Ohio:

"The highest stage reached at Portsmouth, Ohio, was 58.4 feet. Danger line correct at 50 feet. River over danger line for eight days. The river commenced rising on the 19th. On the 20th a warning was sent by the Weather Bureau saying that the river would exceed the danger line on the 21st. This warning was immediately posted, and also published in the daily papers, and people who dwell on Mill and Front streets and the northern part of the city took heed and moved their goods to places of safety. The Ohio rose steadily until 10 a. m. of the 25th, reaching 58.3 feet, remained stationary until 5 p. m., then rose one-tenth of a foot up to midnight, remaining stationary at 58.4 feet until 3 a. m. of the 26th. Very few of our manufacturing interests shut down and other branches of business went on as usual. The Cincinnati, Portsmouth, and Virginia and Baltimore and Ohio Southwestern railroads were compelled to discontinue running trains through the city for several days. The estimated damage to the city will not exceed $5,000, and within a radius of five miles $5,000 more. Many hundreds of dollars worth of property was no doubt saved by the timely warnings of the Weather Bureau and the prompt action of our city executive."

From the official report of the special river observer at Catlettsburg, Ky., the following is taken:

"The Ohio River at Catlettsburg, Ky., reached the highest stage, 59.1 feet, at 4 a. m. on the 25th, remaining stationary until 5 a. m. of the 26th. The danger-line warning on the 20th was certainly appreciated by all. Copies were posted in conspicuous places, and immediately upon receipt of the warning property owners and business men began to make secure threatened property and to move their stock of goods to higher places. The river men in general did not think we would have much water, but when the warning came it was heeded by all, thus saving much valuable property and damage to movable goods. No serious damage resulted from the high water. About one hundred families had to move to higher quarters. Some few homes were damaged. The damage has been less than from any previous flood we have had here."

The report of the special river observer at Huntington, W. Va., states that the highest point reached by the water at Huntington was 57.4 feet at 7 p. m., April 24, and that it was stationary until 2 a. m. of the next day. He says:

"The danger-line warning received was conveyed in person to those most likely to be damaged by an overflow and the same day published in the Huntington Daily Herald. That it was of great benefit is evidenced by the interviews given in the Herald of the 26th The Huntington papers stated that there was no loss except that which was sustained from business suspensions."

LOUISVILLE, KY., MAY 20, 1901.

A very notable flood occurred in this section of the Ohio during the last week of April.

Heavy rains, and in some localities, snow, had fallen over the watershed from the 17th to the 23d, inclusive.

On Monday, the 22d, it was evident that a flood stage would be reached at this station and the morning map for that date gave the following forecast:

A very high crest extends from Point Pleasant to Louisville. Point Pleasant has 51 feet, which is 12 feet above the danger line. At Catlettsburg and Portsmouth it is above the danger line, and at Cincinnati it will go above the danger line by noon to-day. The Kentucky River and all other tributaries are high, and the present indications are that the river will pass the danger line at Louisville by Wednesday.

This forecast was given very thorough distribution by telephone and all persons interested advised to keep in touch with this office for further information. The river continued to rise steadily, passing the danger line, 28 feet, at this station, at 3 p. m., Wednesday, the 24th, and reaching the highest stage, 33.3 feet, at 6 p. m. of the 28th. It remained almost stationary for nearly 36 hours and then fell very slowly, being above 30 feet at the close of the month. The danger line at Madison, Ind., 46 feet, was passed during the night of the 24th, and the maximum, 49.9, was reached on the 28th.

Owing to the fact that accurate and timely forecasts were given out each day, perishable property was all moved out of the way and no serious loss resulted from the flood, except the damage incident upon the soaking of buildings along the water front.

The accuracy and timeliness of the forecasts issued by the Weather Bureau were very favorably commented upon by those who were thereby enabled to avoid serious losses.

EVANSVILLE, IND., MAY 20, 1901.

The rise which began on April 20 continued steadily until the end of the month. The greatest rise during any twenty-four hours was 4.9 feet from the morning of the 22d to the morning of the 23d, and the danger line, 35 feet, was reached at 1 p. m. of the 24th. The river reached its highest stage on the 30th, becoming stationary at 41.8 feet, and remaining so nearly forty-eight hours before beginning to fall.

A telegram was received at 7:55 p. m. of the 21st, from the official at Pittsburg, stating that the river was approaching 20 feet rapidly and might reach 30 feet at that place by the next morning. This information was given the morning newspapers for publication and telephoned to as many river men as could be reached.

On the 22d a telegram was received from the observer at Cairo stating that a stage of river approximating 35 feet would be reached at Evansville within the next two or three days, and on the 23d a telegram from the same source stated that a crest stage of over 40 feet was indicated for Evansville on the present rise. This information was at once communicated to river men and owners of farm property along the river and was received in time to enable them to save their stock, etc., by removal to places of safety. At this time the corn bottom lands above the city were being gradually flooded and property owners were preparing to leave their houses. About three-fourths of the bottom lands in this vicinity, much of which this year is planted in wheat and oats, are covered when the river reaches a stage of 40 feet.

The loss to crops in this vicinity, besides the corn in bottom lands above the city, includes about three-fourths of all the crops in Union township, and a small part of Perry township, in this county, in all about 1,000 acres of wheat, the money value of which will amount to about $15,000. There was practically no damage done to farm property, fences, etc., and none to stock. Cribbed corn was not damaged, it being considered safe at a much higher stage of water than that reached.

So far as property in the City of Evansville is concerned, there was practically no loss. Several cellars in the upper part of the city were flooded but the damage done was slight.

CAIRO, ILL., MAY 20, 1901.

A rise in the upper Ohio River, cresting at Cincinnati on April 8 and at Evansville on April 11, together with rises out of the Cumberland, Tennessee, and upper Mississippi rivers, brought the Ohio River at Paducah up to 31.2 feet on April 12 and to 38.8 feet at Cairo on April 13. A fall set in at Evansville and Paducah on the 12th and at Cairo on the 13th, which continued at the places named until the morning of the 20th. During this rise the only place in the Cairo district at which the danger-line stage was reached was Johnsonville, Tenn., where the river attained a maximum stage of 22.6 feet on April 10. Ample warnings of this rise were sent to places interested.

A second rise, commencing at Nashville on April 13, at Chattanooga on the 14th, and at Cincinnati on the 17th, with the Wabash adding its quota from the 17th to the 23d, kept the lower Ohio River rising throughout the last decade of April. This rise crested at Evansville on the afternoon of the 30th, at 41.8 feet; at Paducah on May 1, at 39.4 feet, and at Cairo on the evening of May 1, at 43.2 feet.

The maximum stage predicted for Evansville was approximately 42 feet; the maximum stage predicted for Cairo was between 44 and 45 feet.

A supplementary forecast was issued for Cairo on April 26, to the effect that, unless rains occurred within the following two or three days sufficient to check the fall in the upper Mississippi and the tributaries to the lower Ohio, the stage at Cairo would approximate 43 feet.

At Florence, Ala., the maximum stage reached was 16.3 feet, on April 23; at Johnsonville, Tenn., the crest was 24.7 feet, on April 27. The maximum stages predicted for Florence and Johnsonville were approximately 17 and 25 feet, respectively.

The flood did comparatively little damage in the Cairo district. Some wheat was drowned out and some corn in bottom lands damaged or destroyed.

At Shawneetown, Ill., stock, farming implements, and household effects were protected and saved. The river observer at that place concludes his report with the remark: "No property lost; plenty of time, and all saved. Thanks for the valuable information."

At Paducah, Ky., very little damage resulted from the flood, prompt action having been taken to remove stock and grain. The approximate value of the property protected was $500,000, and the warnings were of inestimable value.

At Cairo, Ill., the low places about the city were flooded, but very little inconvenience resulted from this condition. The farmers in the vicinity of Cairo were not alarmed, for at no time was it thought that the river would reach the danger line (45 feet) at Cairo.

On the lower Tennessee River little damage resulted from the high water. Some low lands were flooded, which delayed plowing.

During the progress of the flood information was furnished almost daily, by telephone, to the following named places: Slough Landing, Dyersburg, Reelfoot, Samburg, and Obion, Tenn.

The large volume of water in the Mississippi River at the close of the preceding month increased steadily from the Minnesota stations to New Orleans, La., and from the 28th to 30th the danger line was reached or closely approximated at all points south of New Madrid, Mo.

The waters of the Tennessee and Cumberland rivers were generally at flood stages from the 21st to the 27th and about the same period freshets occurred in the upper Potomac and James rivers.

The rivers of the east Gulf and South Atlantic systems were generally higher than in March, and in several of them the conditions were threatening about the first of the month and again near its close.

No unusual conditions were reported from the Missouri and other western streams.

The highest and lowest water, mean stage, and monthly range at 135 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport on the Red.—*Geo. E. Hunt, Chief Clerk, Forecast Division.*

CLIMATE AND CROP SERVICE.

By James Berry, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather and crop conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Precipitation is expressed in inches and temperature in degrees Fahrenheit.

Alabama.—The mean temperature was 57.4°, or 6.0° below normal; the highest was 91°, at Gadsden on the 30th, and the lowest, 26°, at Tuscumbia on the 4th. The average precipitation was 5.27, or 0.78 above normal; the greatest monthly amount, 7.79, occurred at Mobile, and the least, 3.43, at Pine Apple.

Heavy rains during first few days and during latter part of second decade, inundated much prepared land, delaying planting thereon. Cool weather of first two decades, with some frost, killed much young cotton, necessitating very general replanting; damage to fruit comparatively slight.—*F. P. Chaffee.*

Arizona.—The mean temperature was 61.3°, or 2.8° below normal; the highest was 104°, at Mohawk Summit on the 14th, and the lowest, 11°, at Strawberry on the 10th. The average precipitation was 0.17, or 0.19 below normal; the greatest monthly amount, 0.90, occurred at Fort Defiance, while none fell at a number of stations.

Alfalfa, barley, and wheat, stimulated by a continued excess of temperature during the winter months, were in a forward stage of advancement in the lower agricultural valleys, and haying was in active progress by the second decade of the month. In the irrigated sections the staple crops are growing under most favorable conditions, and the outlook for more than average yield is promising.—*W. G. Burns.*

Arkansas.—The mean temperature was 58.1°, or 4.7° below normal; the highest was 96°, at Jonesboro on the 29th and 30th, and the lowest, 22°, at Pond on the 3d. The average precipitation was 3.82, or 0.71 below normal; the greatest monthly amount, 5.48, occurred at Arkadelphia, and the least, 1.37, at Arkansas City.

Cold, wet weather during the first three weeks retarded farm work and the growth of crops, but the last week was warm and favorable for planting. Corn planting was about completed, some had to be replanted, owing to the seed rotting in the ground. Cotton planting was progressing, much of the early had to be replanted. Wheat and oats were doing well, and irish potatoes were also doing well generally, but in some places they were rotting in the ground. Frost was general in the northern part of the State on the 18th and 19th and did some damage to tender vegetation. The outlook for fruit was generally good, but had been damaged slightly by frost and hail in the northern part of the State.—*E. B. Richards.*

California.—The mean temperature was 55.8°, or 1.9° below normal; the highest was 102°, at Salton on the 21st, and the lowest, zero, at Bodie on the 4th and 5th. The average precipitation was 2.16, or 0.36 above normal; the greatest monthly amount, 7.48, occurred at La Porte, while none fell at 10 stations.

Very unfavorable weather conditions prevailed during a greater part of April. The temperature was below normal, and killing frosts considerably reduced the prospective crop of deciduous fruits. Dry northerly winds and the absence of normal precipitation until near the close of the month were detrimental to late grain and pasturage. All crops were greatly benefited by the rain commencing on the 28th.—*Alexander G. McAdie.*

Colorado.—The mean temperature was 44.2°, or 1.5° below normal; the highest was 87°, at Lamar on the 25th and 30th and Las Animas on the 30th, and the lowest, 15° below zero, at Breckenridge on the 2d. The average precipitation was 2.21, or 0.51 above normal; the greatest monthly amount, 5.60, occurred at Sugar Loaf, and the least, trace, at Gunnison.

Weather more favorable than usual to agricultural interests. Cold and stormy period 9th to 16th and work at standstill in nearly all districts, but latter half of month exceedingly favorable to farming operations and advancement of vegetation. Large area set apart for sugar beets in Arkansas Valley, on western slope, and in several of the north-central counties. Wheat seeding practically completed in San Luis Park, and well advanced elsewhere. Early sown grains give promise of good stand. Fruits generally in fine condition, and outlook favorable to good crop.—*F. H. Brandenburg.*

Florida.—The mean temperature was 65.2°, or 4.2° below normal; the highest was 92°, at Clermont on the 1st, and the lowest, 33°, at St. Francis on the 22d. The average precipitation was 2.26, or 0.29 below normal; the greatest monthly amount, 7.45, occurred at Pensacola, and the least, 0.46, at Key West.

During the first decade work was delayed on lowlands, which were too wet, and where much replanting was necessary. Low temperatures during the greater portion of the month retarded the growth of all crops, particularly cotton, corn, melons, and vegetables. On the 22d frost formed inland as far south as the central district. In western and northern counties some corn and cotton were killed.—*A. J. Mitchell.*

Georgia.—The mean temperature was 57.0°, or 7.1° below normal; the highest was 91°, at Allentown on the 30th and the lowest, 29°, at Dahlonega on the 3d. The average precipitation was 4.21, or 0.76 above normal; the greatest monthly amount, 10.61, occurred at Clayton, and the least, 1.30, at Albany.

The coldest April in the history of the State climatic service, and probably the coldest within the past 30 years. Local departures of from 8° to 10° below the normal were of common occurrence. Rainfall slightly more than normal for the entire State, but deficient in the southeast. Heavy gales prevailed on several days. Effects of the weather detrimental to crops; much young cotton killed and corn damaged, and considerable replanting necessary.—*J. B. Marbury.*

Idaho.—The mean temperature was 42.8°, or 2.0° below normal; the highest was 84°, at Garnet on the 19th and 22d, and the lowest, 10° below zero, at Lake on the 1st. The average precipitation was 1.07, or 0.28 below normal; the greatest monthly amount, 2.70, occurred at Lake, and the least, 0.05, at Hailey.

No violent storms or damage reported.—*S. M. Blandford.*

Illinois.—The mean temperature was 50.1°, or 2.5° below normal; the highest was 93°, at Bloomington and Centralia on the 29th, and the lowest, 21°, at Dwight on the 1st. The average precipitation was 1.86, or 1.45 below normal; the greatest monthly amount, 3.98, occurred at Raum, and the least, 0.13, at Bushnell.

Cold weather retarded growth of vegetation during the greater part of the month, and wet weather delayed the seeding of oats and farm work generally. Warm and dry weather at the end of the month advanced farm work and vegetation rapidly.—*M. E. Blystone.*

Indiana.—The mean temperature was 48.7°, or 3.7° below normal; the highest was 92°, at Terre Haute on the 30th, and the lowest, 20°, at Syracuse on the 1st. The average precipitation was 2.67, or 0.30 below normal; the greatest monthly amount, 7.12, occurred at Greensburg, and the least, 0.69, at Hammond.

Frequent rains improved growing crops, but, the ground being too wet in most fields, plowing for corn, seeding, and gardening progressed slowly. Cool and generally cloudy weather prevailing, growing crops improved very slowly, and trees and shrubs remained leafless until the last few days of the month, when the exceedingly warm, sunny weather brought out the foliage, crops grew more rapidly, and everything looked bright and green. Ice and white frost in localities on the 19th and 20th apparently caused no great damage. At the end of the month wheat, rye, clover, timothy, pasturage, and meadows were much improved and in excellent condition. Tobacco plants were coming up nicely. Barley and oats were nearly all sown; early-sown oats were coming up well in some fields. Plum, peach, apricot, and cherry trees were in bloom, and other fruit buds were swelling. Most of the gardens were made and nearly all of the early potatoes had been planted. Plowing for corn

advanced quite rapidly during the last few days, and in a few fields corn was planted. Sheep shearing had begun in the southern portion of the State. Live stock was in good condition. Floods in the Ohio River bottoms destroyed many fields of wheat.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 49.9°, or about normal; the highest was 92°, at Sigourney and Fruitland on the 29th and 30th, and the lowest, 15°, at Monticello on the 1st. The average precipitation was 1.79, or 1.41 below normal; the greatest monthly amount, 3.47, occurred at College Springs, and the least, 0.66, at Le Claire.

Season opened late, farming operations being delayed by excessive moisture in March and early part of April. Seeding progressed slowly through first and second decades. Last decade warm, dry, and favorable for seeding and plowing. A beginning was made in corn planting as early as the 27th. The season was favorable for pastures, meadows, and fruit.—*John R. Sage.*

Kansas.—The mean temperature was 53.0°, or 3.0° below normal; the highest was 96°, at Gove on the 26th, and the lowest, 12°, at Tribune on the 2d. The average precipitation was 3.71, or 1.34 above normal; the greatest monthly amount, 7.25, occurred at Anthony, and the least, 1.46, at Wallace.

A cool month, the temperature being below normal until the 24th, when it rose above normal, remaining above the rest of the month. The precipitation was quite excessive during the first half, with occasional showers the last half of the month. The wet weather prevented farm work during a large part of the month, but the warm, dry weather the last of the month made great changes. Wheat grew rapidly. At the close of the month corn planting was well advanced in southern and had begun in northern counties; peaches and plums in bloom in north, apples in south; oat and flax sowing about finished, with oats coming up; alfalfa growing rapidly and pastures beginning to support stock.—*T. B. Jennings.*

Kentucky.—The mean temperature was 50.9°, or 5.3° below normal; the highest was 91°, at Earlington on the 29th and at Greensburg, Manchester, and Paducah on the 30th, and the lowest, 23°, at Shelby City on the 9th. The average precipitation was 4.01, or 0.18 above normal; the greatest monthly amount, 7.23, occurred at Williamsburg, and the least, 2.22, at St. John.

A very cold, backward month. An extremely cold spell occurred from the 18th to the 25th, with freezing weather at many stations and heavy snow on the 19th and 20th in the eastern portion. Nothing was seriously injured by the cold spell, but the growth of all vegetation was checked, and in many places corn had rotted in the ground, making it necessary to replant many fields. The month closed with mild, pleasant weather.—*H. B. Hersey.*

Louisiana.—The mean temperature was 63.1°, or 4.3° below normal; the highest was 95°, at Covington on the 30th, and the lowest, 28°, at Plain Dealing on the 3d. The average precipitation was 5.39, or 0.65 above normal; the greatest monthly amount, 10.30, occurred at New Iberia, and the least, 2.39, at Alexandria.

With the exception that low temperature retarded germination and growth of vegetation, the weather was very favorable to agricultural interests during the first half of April. Plowing and planting were further advanced than is usual at that time of year. On the 17th and 18th heavy and in many places flooding rains fell, washed out planted corn and cotton or packed the ground so that the sprouts from recently-planted seed could not get through; drowned some rice, and made it necessary to plow and plant again a large acreage of cotton and replant much corn. The rains were followed by frost on the 19th and 20th, and low temperatures for several days, causing further injury to corn and cotton that were above ground. At the last of the month higher temperature prevailed and farm work was progressing rapidly.—*W. T. Blythe.*

Maryland and Delaware.—The mean temperature was 49.2°, or 2.8° below normal; the highest was 90°, at Hancock, Md., on the 29th and 30th, and the lowest, 15°, at Deerpark, Md., on the 12th. The average precipitation was 5.72, or 2.80 above normal; the greatest monthly amount, 7.97, occurred at Frostburg, Md., and the least, 3.30, at Harney, Md.

A March type of weather conditions continued into April, cold, cloudy, and wet, with frequent stormy periods. Fortunately there were no severe cold waves or damaging frosts to hurt field crops or fruit in the interior, while in the mountain districts of the extreme west all tender vegetation was dormant, so that the heavy snows and low temperatures of that section were without injury. The month closed with work behind, and the season late for oats, tobacco, corn, and minor crops. Wheat, rye, and barley, are excellent in growth; grass not so good; fruit outlook unimpaired in all districts.—*Oliver L. Fassig.*

Michigan.—The mean temperature was 44.4°, or 0.9° above normal; the highest was 88°, at Houghton on the 27th, and the lowest, zero, at Thomaston on the 1st. The average precipitation was 1.34, or 0.71 below normal; the greatest monthly amount, 3.30, occurred at Arbela, and the least, 0.10, at Ewen

The advance of the season has been quite steady and equable during April. The early part of the month was dry, but sufficient rainfall occurred during the period extending from the 16th to the 24th to generally benefit wheat, rye, clover, meadows, pastures, and plowing. At the close of the month all fruit buds were in excellent condition, not having been forced by any early warm waves, and promising abundant yields; oat seeding was well advanced and plowing for corn, beans, and potatoes general.—*C. F. Schneider.*

Minnesota.—The mean temperature was 46.7°, or 2.0° above normal; the highest was 91°, at Willow River on the 29th, and the lowest, 6°, at Lake Winnibigoshish on the 17th. The average precipitation was 1.73, or 1.00 below normal; the greatest monthly amount, 3.34, occurred at Pine River Dam, and the least, 0.66, at Glencoe.

Weather conditions have generally been favorable for farm work, except in southeastern counties, where it was too wet until late in the month. Wheat seeding begun in central and southwestern portions by the 5th, was nearly finished by the end of the month in all parts of the State, except on the low lands of the Red River Valley. Oats and barley were also nearly all seeded, except in the southeastern counties. Early sown wheat was coming up nicely late in the month.—*T. S. Outram.*

Mississippi.—The mean temperature was 60.0°, or 5.1° below normal; the highest was 97°, at Windham on the 30th, and the lowest, 30°, at Saratoga on the 21st. The average precipitation was 4.36, or 0.13 below normal; the greatest monthly amount, 9.05, occurred at Biloxi, and the least, 1.28, at Hernando.

Frosts from the 19th to 22d, inclusive, together with previous cool weather, killed nearly all cotton that was up, caused sprouting seed to rot, and injured corn in many counties.—*W. S. Belden.*

Missouri.—The mean temperature was 53.2°, or 2.6° below normal; the highest was 94°, at Unionville on the 29th, and the lowest, 24°, at Potosi on the 21st. The average precipitation was 2.85, or 0.94 below normal; the greatest monthly amount, 5.41, occurred at Cowgill, and the least, 0.89, at Steffenville.

From April 1st to 18th the weather was generally cold, stormy, and disagreeable, with snow on the 1st and 2d, and again on the 17th, and little farm work was done; but during the last ten days of the month the weather was all that could be desired and work progressed rapidly. By the close of the month oat sowing was completed and corn planting was well under way in most sections. Heavy frosts on the 18th, 19th, 20th, and 21st damaged fruit buds to some extent in a few of the southern counties, but in general fruits of all kinds escaped injury and promised an abundant crop. Winter wheat continued in excellent condition, as a rule.—*A. E. Hackett.*

Montana.—The mean temperature was 42.6°, or 0.8° below normal; the highest was 92°, at Ridgelawn on the 30th, and the lowest, 1° below zero, at Adel on the 27th. The average precipitation was 1.19, or 0.04 below normal; the greatest monthly amount, 3.26, occurred at Dillon, and the least, trace, at Ekalaka.

The season is three weeks later than last year. Grass is very slow in starting. Heavy snow on April 26th in the west and central portions was very beneficial to crops and grass on the ranges.—*E. J. Glass.*

Nebraska.—The mean temperature was 48.9°, or 0.4° below normal; the highest was 95°, at Beaver City on the 26th, and the lowest, 5°, at Curtis on the 1st. The average precipitation was 2.32, or 0.25 below normal; the greatest monthly amount, 6.01, occurred at Holdrege, and the least, 0.40, at Pleasanthill.

Nearly a normal month in temperature and rainfall, and all crops have grown well. Winter wheat is in especially good condition.—*G. A. Loveland.*

Nevada.—The mean temperature was 45.3°, or 1.9° below normal; the highest was 98°, at Las Vegas, and the lowest, 2° below zero, at Monitor Mill. The average precipitation was 0.59, or 0.13 below normal; the greatest monthly amount, 2.20, occurred at Lewers Ranch, while none fell at Los Vegas.

The first half of the month was cold and unfavorable for the germination of seed and the growth of grass, grain, and alfalfa. The latter half was much warmer and more favorable to agricultural interests. Heavy and widely distributed showers on the 30th were of immense benefit to all kinds of vegetation.—*J. H. Smith.*

New England.—The mean temperature was 44.7°, or 1.0° below normal; the highest was 87°, at North Grovenor Dale, Conn., on the 29th, and the lowest, 15°, at Flagstaff, Me., on the 12d. The average precipitation was 6.86, or 3.85 above normal; the greatest monthly amount, 13.37, occurred at Middletown, Conn., and the least, 1.74, at St. Johnsbury, Vt.

Generally cloudy and cool weather, with excessive precipitation. No severe or destructive storms. Growing crops, winter grain, and grass are in good condition; the latter assures a large hay crop. Spring planting and seeding retarded by unfavorable weather and wet condition of soil. The season is somewhat backward, variously estimated from a week to ten days.—*J. W. Smith.*

New Jersey.—The mean temperature was 48.3°, or 0.8° below normal; the highest was 89°, at Belvidere and Paterson on the 30th, and the lowest, 23°, at Charlotteburg on the 13th. The average precipitation was 6.31, or 2.89 above normal; the greatest monthly amount, 10.22, occurred at Charlotteburg, and the least, 3.46, at Atlantic City.

Weather conditions during the month were most unfavorable for all farming operations; frequent heavy rains delayed plowing and planting and the cool easterly winds, with almost continued cloudiness, retarded germination and plant growth. Winter wheat, rye, and grass are all backward. The rainfall at New Brunswick, 7.75 inches, is the largest recorded since 1874, when it was 8.25.—*E. W. McGann.*

New Mexico.—The mean temperature was 50.6° or 2.0° below normal; the highest was 100°, at San Marcial on the 28th, and the lowest, 3°, at Winsors on the 2d. The average precipitation was 0.70, or about normal; the greatest monthly amount, 3.43, occurred at Folsom, while none fell at Gage, and only trace at Deming and San Marcial.

Cool and windy; vegetation backward.—*R. M. Hardinge.*

New York.—The mean temperature was 45.2°, or 1.4° above normal; the highest was 86°, at Cedar Hill and Wells on the 29th, and the lowest, 14° at Adirondack Lodge on the 12th. The average precipitation was 5.19, or 2.64 above normal; the greatest monthly amount, 11.32, occurred at Mohonk Lake, and the least, 0.95, at Number Four.

Farm operations were delayed during the first half of the month by cold, wet weather, but some progress was made during the latter half, the season, however, being very backward and work much delayed. The precipitation was heavier than during any other April in twelve years, causing much damage by floods and seriously delaying work on low lands.—*R. G. Allen.*

North Carolina.—The mean temperature was 52.4°, or 5.3° below normal; the highest was 89°, at Brewers on the 30th, and the lowest, 21°, at Highlands on the 22d. The average precipitation was 5.83, or 2.06 above normal; the greatest monthly amount, 10.53, occurred at Patterson, and the least, 2.00, at Wilmington.

The month was decidedly unfavorable for farm work and for the growth of crops, on account of the heavy rains at the beginning and during the middle portion of the month, and the continuously cold weather, which prevented germination and growth. In spite of the heavy snowstorm and freezing temperatures in the western district, April 20–21st, the fruit crop was not seriously injured. Wheat, rye, and oats continued in excellent condition. Planting cotton and corn was much delayed and considerable replanting was necessary.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 44.5°, or 3.3° above normal; the highest was 92°, at Berthold Agency and Medora on the 30th, and the lowest, 10°, at Falconer on the 17th. The average precipitation was 0.98, or 0.81 below normal; the greatest monthly amount, 2.89, occurred at Larimore, and the least, trace, at Coal Harbor, New England City, and Steele.

The greater part of the month was not generally favorable for farm work. High winds, with considerable freezing weather, delayed seeding until the last of the month, when it progressed rapidly under very favorable conditions.—*B. H. Bronson.*

Ohio.—The mean temperature was 46.7°, or 3.8° below normal; the highest was 91°, at Annapolis on the 30th, and the lowest, 18°, at Green Hill and Warsaw on the 1st. The average precipitation was 3.40, or 0.48 above normal; the greatest monthly amount, 8.96, occurred at Lowell, and the least, 1.12, at Cardington.

The mean temperature for the State was the lowest recorded in April since the establishment of the voluntary service in 1883. The snowstorm of the 19th to 22d was phenomenal, and accompanied by heavy rainfall, caused very damaging floods in the Ohio Valley. Wheat fields were in a more flourishing condition at the end of the month than at any previous date this spring. Corn planting generally begun in the south. Fruit blooming very heavily.—*J. Warren Smith.*

Oklahoma and Indian Territories.—The mean temperature was 57.8°, or 3.6° below normal; the highest was 97°, at Pawhuska on the 25th and 26th, and the lowest, 23°, at Kenton on the 6th. The average precipitation was 2.95, or 0.41 above normal; the greatest monthly amount, 7.90, occurred at Tahlequah, Ind. T., and the least, 1.00, at Colbert, Ind. T.

The forepart of the month was unusually cold and greatly hindered the growth and germination of the crops in the ground. Killing frosts occurred on the 17th and 18th. A general storm of sleet and snow on the 17th, and a violent local thunderstorm on the 26th in Woods County, caused considerable damage. Wheat and oats made a slow growth and were badly damaged by insects, particularly oats, the damage ranging from slight to a total loss as one progresses southward. Corn, cotton, millet, and other crops were being planted and coming up to good stands.—*Charles M. Strong.*

Oregon.—The mean temperature was 47.5°, or 1.6° below normal; the highest was 78°, at Grants Pass on the 2d, at Aurora on the 9th, and at Buckhorn Farm on the 17th, and the lowest, 11°, at Silverlake on the 6th. The average precipitation was 3.27, or 0.07 above normal; the greatest monthly amount, 13.05, occurred at Glenora, and the least, trace, at Prineville.

The month was cool throughout, with frosty nights and moderately warm days. Crops in general made slow but satisfactory advancement. Peaches, apricots, and early cherries were considerably damaged by frosts, but other fruit, especially apples and prunes, promise well.—*Edward A. Beals.*

Pennsylvania.—The mean temperature was 47.2°, or 0.7° below normal; the highest was 95°, at Carlisle on the 29th, and the lowest, 16°, at Hawthorn on the 12th. The average precipitation was 5.41, or 1.94 above normal; the greatest monthly amount, 9.18, occurred at Chambersburg, and the least, 1.46, at Carlisle.

Heavy precipitation and much cloudiness have made the season backward for crops. Up to the 26th little farm work was accomplished. Ground much of the time was too wet to plow, and little planting was undertaken except on high lands and hills. Cold and wet condition of ground was unfavorable for germination of seed, and at some places replanting will be necessary, as seed rotted. Following a long period of wet and cloudy weather the last four days of the month were ideal. The sun shone from morn till night and temperatures ranged up to summer heat. With a prolongation of fair weather farm work will be pushed rapidly throughout the State.—*L. M. Dey.*

Porto Rico.—The mean temperature was 77.5°, or 1.8° above normal; the highest was 97°, at Bayamon on the 7th and 29th, and at Cayey on the 7th, and the lowest, 54°, at Cidra on the 1st. The average precipitation was 3.00, or 3.30 above normal; the greatest monthly amount, 8.68, occurred at Isabella, and the least, 0.21, at Comerio.

The weather during April was somewhat unfavorable for general farming interests. Crops over the southern portion of the island were badly damaged by the drought. Pasturage is very scarce and stock is suffering. Planting of new crops has been retarded in most districts, and at the close of the month rain was badly needed, especially over the southern portions of the island. Conditions were exceptionally favorable for saving sugar cane. Grinding has been rushed and is nearing completion on some of the small plantations. A large acreage has been devoted to sugar cane, but the yield is not as good as was expected. The new crop of cane is doing well, except where damaged by the drought. Some cane is still being planted, and with favorable weather, an increased acreage is promised. Coffee is doing exceptionally well, auguring a good yield. Berries have formed and are growing very fast; some now taking on a perfect formation. Cutting and curing of tobacco continues; harvesting of the crop is nearing completion.—*Joseph L. Cline.*

South Carolina.—The mean temperature was 56.0°, or 6.2° below normal; the highest was 89°, at Spartanburg on the 30th, and the lowest, 30°, at Liberty on the 4th. The average precipitation was 5.03, or 2.00 above normal; the greatest monthly amount, 10.58, occurred at Yorkville, and the least, 1.64, at Charleston.

It was the coolest April of record, and ranks third in precipitation. The general weather conditions were unfavorable for preparing lands, planting, germination, and for growth of vegetation. Corn and cotton planted early in the month did not come up well and much replanting was necessary. Fruit escaped the numerous light frosts unhurt.—*J. W. Bauer.*

South Dakota.—The mean temperature was 48.8°, or 2.0° above normal; the highest was 96°, at Forestburg on the 30th, and the lowest, 11°, at Redfield on the 17th. The average precipitation was 1.56, or 1.20 below normal; the greatest monthly amount, 2.95, occurred at Oelrichs, and the least, 0.12, at Mound City.

Prior to the 20th the seeding, germination, and growth of spring wheat, oats, barley, and rye, and the growth of grass, were retarded by showers or cool weather and to some extent by frosty nights, but fairly good progress was made. After the 20th the conditions were generally more favorable for germination and growth and healthy progress of all vegetation, except that a southerly gale on the 26th uncovered some spring wheat and oats on light soil, necessitating some reseeding.—*S. W. Glenn.*

Tennessee.—The mean temperature was 53.1°, or 5.0° below normal; the highest was 90°, at Johnsonville, Liberty, and Memphis on the 30th, and the lowest, 23°, at Bristol on the 20th. The average precipitation was 4.70, or 0.10 above normal; the greatest monthly amount, 8.72, occurred at Rugby, and the least, 1.60, at Memphis.

The first three weeks were unfavorable to seed in the ground and to young plants on account of the low temperature and lack of sunshine, but the month closed with a week of very fine spring weather, which had an exceedingly favorable effect on vegetation generally. At the close of the month wheat and oats were in fine condition of growth, as a rule; the bulk of the cotton area had been planted; stands of early corn were poor; tobacco plants were small but healthy; fruit was not materially injured by the cold.—*Roscoe Nunn.*

Texas.—The mean temperature was 63.0°, or 3.3° below normal; the highest was 100°, at Fort Ringgold on the 16th, and the lowest, 26°, at Amarillo and Hale Center on the 2d. The average precipitation was 1.97, or 0.73 below normal; the greatest monthly amount, 6.45, occurred at Camp Eagle Pass, while none fell at Valentine.

The rainfall continued below normal throughout the month, and in some localities the deficiency was marked. The bulk of the corn crop was in the ground before the opening of the month, but planting was carried on in scattered localities during the month. Cool nights and dry weather proved very unfavorable. Cotton planting was retarded by dry weather; that put in the ground early in the month came up to good stands, but later planting did not come up well. Dry weather and insects seriously injured the wheat and oat crops.—*I. M. Cline.*

Utah.—The mean temperature was 46.2°, or 1.5° below normal; the highest was 89°, at Hite and Moab on the 30th, and the lowest, zero, at Loa on the 7th. The average precipitation was 0.69, or 0.46 below normal; the greatest monthly amount, 2.35, occurred at Fillmore, and the least, trace, at Emery.—*L. H. Murdoch.*

Virginia.—The mean temperature was 50.0°, or 4.6° below normal; the highest was 92°, at Fontella on the 30th, and the lowest, 21°, at Burkes Garden on the 21st. The average precipitation was 6.04, or 2.77 above normal; the greatest monthly amount, 9.10, occurred at Wytheville, and the least, 3.45, at Birdsnest.

The month was unusually cold, cloudy, and stormy, and the advance of vegetation, as well as the progress of farm work incident to the season, was greatly delayed. Snow fell to unusual amounts in portions of the Great Valley division, and light to killing frosts occurred, but no special damage resulted from either.—*Edward A. Evans.*

Washington.—The mean temperature was 45.9°, or 2.2° below normal; the highest was 79°, at Pasco on the 10th, and the lowest, 11°, at Republic on the 3d. The average precipitation was 3.49, or 0.76 above normal; the greatest monthly amount, 13.42, occurred at Clearwater, and the least, trace, at Pasco.

The weather was in general too cool for rapid growth of crops, but was not unfavorable to winter wheat and early spring wheat. Spring seeding was late and fruit bloomed two or three weeks later than usual.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 47.5°, or 5.1° below normal; the highest was 95°, at Point Pleasant on the 30th, and the lowest, 18°, at Philippi on the 1st. The average precipitation was 7.05, or 3.53 above normal; the greatest monthly amount, 10.70, occurred at Clay, and the least, 4.95, at Beverly.

The cold, stormy, and unseasonable weather, with excessive precipitation, was very unfavorable for farm work and the growth of vegetation, so that little advancement was made. At the close of the month work was behind, grass short, gardens backward, wheat below average condition, feed scarce, stock in poor condition and the prospects for fruit promising.—*E. C. Vose.*

Wisconsin.—The mean temperature was 46.7°, or 2.2° above normal; the highest was 90°, at Prairie du Chien and Pine River on the 30th, and the lowest, 12°, at Amherst on the 1st and at Spooner on the 19th. The average precipitation was 0.85, or 1.92 below normal; the greatest monthly amount, 2.22, occurred at Barron, and the least, trace, at West Bend.

The month was one of the driest Aprils on record, especially in the southern section, where the total precipitation was only about 20 per cent of the normal. The effect of the drought is most noticeable on meadows and pastures. Early sown grain is coming up nicely and preparations for corn and potatoes are progressing rapidly.—*W. M. Wilson.*

Wyoming.—The mean temperature was 40.3°, or 1.0° below normal; the highest was 88°, at Alcova on the 28th, and the lowest, 15° below zero, at Centennial on the 17th. The average precipitation was 1.31, or 0.40 below normal; the greatest monthly amount, 3.11, occurred at Lander, while none fell at Lovell (Byron P. O.)—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

THE THEORY OF THE FORMATION OF PRECIPITATION ON MOUNTAIN SLOPES.

By Prof. F. POCKELS, School of Technology, Dresden, Germany. Translated from Ann. d. Physik, 1901. (4) Vol. III, pp. 459-480.

It is a well known principle of climatology that the side of a mountain range which is turned toward the prevailing wind has in general a greater precipitation than the plain on the windward side, and a still greater in comparison with the leeward side of the mountain range. There has been no doubt as to the explanation of this phenomenon since it has been recognized that the principal cause of the condensation of the aqueous vapor is the adiabatic cooling of the rising mass of air; for a current of air impinging against rising ground must, in order to pass over it, necessarily rise. So far as the author knows, however, no attempt has yet been made to investigate this process quantitatively, except perhaps, for the stratum of air immediately contiguous to the earth, whose ascension being equal to that of the surface itself, is thereby known directly. Such a quantitative treatment will be attempted in the following article. Even although this is only possible under special assumptions which represent nature with the closest approximation, it will, however, always offer a practical basis for estimating the purely mechanical influence exerted by the configuration of the surface of the earth on the formation of rain.

1.

In order to find the standard vertical components of the velocity of the air currents that determine the condensation, we must, first of all, solve the hydrodynamic problem of the movement of the air over a rigid surface of a given shape. In this connection we must make a series of simplified assumptions, as follows:

1. The current must be stationary; 2, it must be continuous and free from whirls; 3, it must flow everywhere parallel to a definite vertical plane, and consequently depend only on the vertical coordinate (y), and one horizontal coordinate (x); 4, the internal friction, as well as the external (or that due to the earth's surface), may be neglected; 5, at great heights there must prevail a purely horizontal current of constant velocity, a. As to the configuration of the ground, we must, corresponding to proposition 3, assume that the profile curves are identical in all vertical planes that are parallel to the plane of $x\,y$; 6, and further, we assume the surface profile to be *periodic*, that is to say, the surface of the earth is formed of similar parallel waves of mountains without, however, determining in advance the special equation of the profile curves.

If we designate by u and v the horizontal and vertical components of velocity and by ε the density, then, in consequence of assumptions 1 and 3, there follows the condition

$$\frac{\partial(\varepsilon u)}{\partial x}+\frac{\partial(\varepsilon v)}{\partial y}=0$$

and in consequence of 2 there must exist a velocity potential, φ, which, according to 3, can only depend upon x and y, so that

$$u=\frac{\partial\varphi}{\partial x}\quad v=\frac{\partial\varphi}{\partial y},\ \text{and}\ \frac{\partial}{\partial x}\left(\varepsilon\frac{\partial\varphi}{\partial x}\right)+\frac{\partial}{\partial y}\left(\varepsilon\frac{\partial\varphi}{\partial y}\right)=0.$$

If we consider that the density of the air in a horizontal direction (excluding large differences of temperature at the same level) changes much more slowly in a horizontal than in a vertical direction, then we can regard ε as a function of y only, and obtain for φ the differential equation—

$$(1)\qquad \varepsilon\,\Delta\varphi=-\frac{\partial\varepsilon}{\partial y}\frac{\partial\varphi}{\partial y}.$$

The law of the diminution of density with altitude will, strictly speaking, be different for each particular case, because the vertical diminution of temperature in a rising current of air, which determines the rate of diminution of density, depends upon the condensation. But it is allowable, as a close approximation and as is usually done in barometric hypsometry, to assume the law of diminution of pressure which obtains, strictly speaking, for a constant temperature only, and which, as is well known, reads as follows:

$$\text{nat log}\,\frac{p_0}{p}=q\,y,$$

where q is a constant and has very nearly the value of 1/8000 if y, the difference in altitude, be expressed in meters. In this case the following also holds good:

$$\log\frac{\varepsilon_0}{\varepsilon}=q\,y,$$

and, consequently,

$$-\frac{1}{\varepsilon}\,\frac{\partial\varepsilon}{\partial y}=q;$$

hence the differential equation for φ becomes

$$(2)\qquad \Delta\varphi=q.\frac{\partial\varphi}{\partial y}.$$

A solution of this differential equation that satisfies the assumptions 5 and 6, is given by the expression

(3) $$\varphi = a\,(x - b\cos mx\,.\,e^{-ny}),$$

in which the following relation exists between the constants m and n.

(4) $$\begin{cases} m^2 - n^2 = qn\,; \\ n = -\frac{q}{2} + r, \text{ where } r = \sqrt{m^2 + q^2/4}. \end{cases}$$

In order to ascertain what profile or configuration of the ground corresponds to the current determined by this velocity potential, we must look for the lines of flow; for one of these must certainly agree with the profile curve. The differential equation of the stream lines reads as follows:

$$dy : dx = \frac{\partial\varphi}{\partial y} : \frac{\partial\varphi}{\partial x} = abn\cos mx\,.\,e^{-ny} : a\,(1 + bm\sin mx\,.\,e^{-ny}).$$

The integration of this equation gives

(5) $$e^{-ny}.\sin mx = -\frac{m}{bqn} + Be^{qy},$$

wherein B represents the parameter of the stream lines.

If we assume that the curve of the profile of the surface passes through the points $x = 0$ and $y = 0$, then for these values $B = m/bqn$, and if its ordinates are designated by η, its equation becomes

$$b\frac{qn}{m}\sin mx.e^{-n\eta} = e^{q\eta} - 1$$

or

$$b\frac{n}{m}\sin mx.e^{-r\eta} = \frac{e^{\frac{q}{2}\eta} - e^{-\frac{q}{2}\eta}}{q}.$$

As long as η remains so small that for both the highest and lowest points of the profile of the surface of the earth $(q\eta/2)^2$ is negligible in comparison with unity — which is practically always the case for the mountains that come under our consideration — we can write

(5′) $$\eta = b\frac{n}{m}\sin mx.e^{-r\eta}; \quad \left[\begin{array}{l} n = -\frac{q}{2} + r, \\ r = \sqrt{m^2 + q^2/4} \end{array}\right].$$

In these expressions b and m appear as parameters that can be chosen at will, the first of which determines the altitudes and the second the horizontal distances between the mountain ridges; we have, namely, $m = 2\pi/\lambda$, if λ denotes the wave length, that is to say the distance between two corresponding points, as for example the summits of neighboring mountain ranges.

It is easy to show that the stream line determined by the velocity potential (3) for the configuration of the ground given by the transcendental equation (5′) is the only one compatible with the general conditions 1 to 5. Moreover, since a potential current is determined single valued, for the interior, by the value of $\frac{\partial\varphi}{\partial n}$ along the boundary of a closed region, therefore, our solution in case it gives horizontal velocities that are constant, or slowly diminish with the altitude above the center of the valley, is also applicable to the specially interesting practical case in which only one single mountain range rises above an extended plain and is struck perpendicularly by a uniform horizontal current of air. To what extent this holds good must be established in each special case.

The horizontal and the vertically upward velocity components corresponding to our solution are:

(6) $$u = a\,(1 + bm\sin mx\,.\,e^{-ny})$$

(7) $$v = abn\cos mx\,.\,e^{-ny}.$$

It would now be desirable, in order to be able to handle the cases actually occurring in nature, to adapt our solution to some form of the earth's surface arbitrarily chosen. The first thought would be to attempt this by the superposition of a series of velocity potentials of the form of equation (3) having different constants m and b, or in other words to write

(8) $$\varphi = \sum \varphi_h = a\left\{x - \sum{}^h b_h\cos m_h x\,.\,e^{-n_h y}\right\};$$

but we find that this solution only corresponds to a superposition of the profile curves, that is to say, it gives

(9) $$\eta = \sum \eta_h = \sum b_h \frac{n_h}{m_h}\sin m_h x\,.\,e^{-r_h \eta}$$

only when we can put the exponential functions $e^{-n_h y}$ and $e^{-r_h \eta}$ both equal to unity. In this case η is at once transformed into the simple trigonometrical series

(9′) $$\eta = \sum{}^h b_h \frac{n_h}{m_h}\sin m_h x$$

and therefore, by putting $m_h = h\,m_1$ we can develop any arbitrary function, $\eta = f(x)$, into a series, proceeding for any value of x greater than zero and less than $\lambda/2$. But the condition that $e^{\pm h m \eta}$ is equal to unity for any large value of the quantity h will not be fulfilled for any arbitrary form of the profile curve if its maximum altitude is assumed to be very small in comparison with the wave length λ. Therefore, we must limit ourselves to an approximate representation of the desired profile curve by a definite number of terms of the series that enters equations (9) or (9′). Especially can we in this way never attain the rigid solution for a ground profile that has sharp angles. However, the neglected higher terms of the series have a proportionately slighter influence on the vertical velocity at great altitudes and, therefore, on the resulting precipitation, in proportion as their serial number h is larger.

2.

As a first example, we choose a form of profile to correspond as closely as possible to a plane, broad valley and a plateau like mountain range, because, in this case, we may expect nearly the same conditions on the slope of the mountain as if it were struck by a uniform horizontal current of air. A profile curve of this kind, which rises steadily between the values x greater than $-\frac{\lambda}{12}$ and less than $+\frac{\lambda}{12}$ and falls also with uniform gradient between the limits $x = 5/12\,\lambda$ and $x = 7/12\,\lambda$, and in the intermediate region describes a horizontal straight line at the distance $+H$ from the axis of x, is obtained by means of the Fourier series

$$\eta = \frac{24\,H}{\pi^2}\sum{}^h \frac{1}{h^2}\sin\frac{h\pi}{6}\sin\frac{2h\pi}{\lambda}x,$$

where h has all positive uneven numbers. In order to represent a profile curve of the given form approximately, we take the first three terms of the series, and therefore have

(10) $$\eta = C\left\{\tfrac{1}{2}\sin m_1 x + \tfrac{1}{9}\sin 3m_1 x + \tfrac{1}{50}\sin 5m_1 x\right\}.$$

The numerical values of the parameters are:

$$\lambda = 60{,}000 \text{ meters, also } m_1 = \frac{2\pi}{\lambda} = 0.1047\times10^{-3}$$

and

$$C = 1{,}100 \text{ meters}.$$

The coefficients b_h, in the expressions (8) and (9) therefore, have the following values:

$$b_1 = 881,\ b_3 = 148.3,\ b_5 = 24.8$$

The profile given by equation (10) is shown in fig. 1, where

the vertical scale is magnified five times. We perceive that the ascending gradient is nearly all confined to the interval between

$$x \text{ greater than } -\frac{\lambda}{12} \text{ and less than } +\frac{\lambda}{12}$$

where, moreover, it is quite uniform, and further, that the surface of the valley is raised a little in the center, and the surface of the plateau mountain is depressed by the same amount. The difference in altitude between the center of the valley and the center of the mountain, which according to the adopted numerical values should be 900 meters, is therefore, not the absolute maximum difference but is about 18 meters less. The profile curve here considered corresponds indeed, according to what has been above said, only approximately to the velocity potential

$$(11) \quad \begin{cases} \varphi = a \left\{ x - b_1 \cos m_1 x \, . \, e^{-n_1 y} - b_3 \cos 3m_1 x \, . \, e^{-n_3 y} \right. \\ \qquad \left. - b_5 \cos 5m_1 x \, . \, e^{-n_5 y} \right\}, \end{cases}$$

as determined by the above coefficients, b_h, but we can easily demonstrate that in the present example the differences could scarcely be observed in fig. 1.

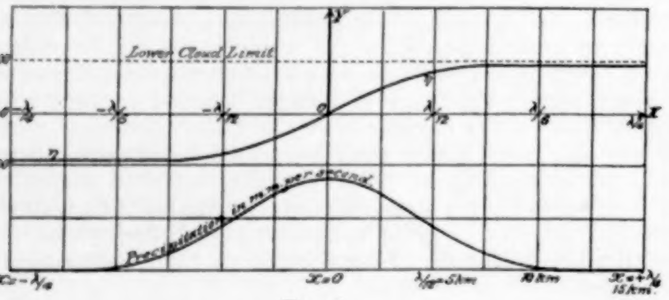

FIG. 1.

From the preceding value of φ we derive the following values for the components of the velocities of the current:

$$(12) \quad \begin{cases} u = a \left\{ 1 + \sum b_h \, m_h e^{-n_h y} \sin m_h x \right\} \\ \quad = a \left\{ 1 + \frac{2\pi}{\lambda} \left(b_1 e^{-n_1 y} \sin m_1 x + 3 \, b_3 \, e^{-n_3 y} \sin 3 \, m_1 x \right. \right. \\ \qquad \left. \left. + 5 \, b_5 \, e^{-n_5 y} \sin 5 \, m_1 x \right) \right\}, \end{cases}$$

$$(13) \quad \begin{cases} v = a \times \sum b_h \, n_h \, e^{-n_h y} \cos m_h x \\ \quad = a \times 0.1152 \left\{ \frac{1}{2} e^{-n_1 y} \cos m_1 x + \frac{1}{3} e^{-n_3 y} \cos 3 \, m_1 x \right. \\ \qquad \left. + \frac{1}{10} e^{-n_5 y} \cos 5 \, m_1 x \right\}. \end{cases}$$

These equations show that when $x = 0$, that is to say above the center of the slope of the mountain, u is a constant $= a$ at all altitudes; above the valley where x is less than 0, u is smaller than a; and above the mountain, or plateau, where x is greater than 0, u is larger than a; the constant a can also be considered the mean horizontal velocity at any given altitude.

For different altitudes H above the center of the valley we have the following values:

$H = 450 + y$:	0	450	2,000	5,000
$\frac{u-a}{a}$:	−0.068	−0.0676	−0.0675	−0.0646

Therefore, up to the altitude of 5,000 meters, the horizontal velocity is sensibly constant and the vertical velocity 0; and, according to what is said in reference to equation (5′) our solution holds good for the case when the profile is continued as a horizontal straight line indefinitely toward the negative side from the point $x = -\lambda/4$, and above this there flows a truly horizontal current of air whose velocity is sensibly constant, namely, 0.93 a up to an altitude of 5,000 meters and increases in the strata above that until it attains the value a.

Above the mountain, as at the point where $x = +\lambda/4$, the velocities, u, are greater than a by nearly as much as they are smaller above the valley.

The distribution of the vertical velocity component which determines the condensation of aqueous vapor is a more complicated matter. In order to represent it, let the values of v/a for different values of the coordinates x and y be as given in the following table:

y	x				
	0	$\pm\frac{\lambda}{12}$	$\pm\frac{\lambda}{8}$	$\pm\frac{\lambda}{6}$	$\pm\frac{\lambda}{4}$
500	0.099	0.0406	0.0129	−0.0012	0
1,530	0.0842	0.04075	0.0149	+0.00226	0
2,440	0.0740	0.0400	0.0182	0.0064	0
3,460	0.0651	0.0387	0.0206	0.0093	0
4,530	0.0575	0.0370	0.0217	0.0108	0

Therefore, whereas there is a steady decrease of v with altitude above the center of the slope of the mountain, on the other hand these vertical velocities increase with the altitude in the neighborhood of the foot of the mountain as well as on the plateau at the point $x = \pm\lambda/8$ up to a maximum at some very great altitude. (The isolated negative value that occurs for $x = \lambda/6$ and $y = 500$ is explained by the above-mentioned slight depression of the summit of the plateau mountain.)

In order, now, to investigate the condensation of aqueous vapor that occurs in consequence of the ascending currents of air forced upward by the upward slope of the ground, we first make the assumption that the ascending mass of air experiences an adiabatic change of condition and that adiabatic equilibrium prevailed already in the horizontal current of air advancing toward the slope of the mountain. In this case the air will be everywhere saturated at a certain altitude that can be computed from the temperature and humidity of the air at the surface of the valley. In a unit of time the quantity of air, $v\,\varepsilon$, flows in a vertical direction through a space having a unit of horizontal surface and an altitude $d\,y$. If this element of space lies above the lower limit of the clouds, then in this quantity of air there will be as much aqueous vapor condensed as the difference between what it can contain in the state of saturation at the altitude $y + d\,y$ and what it can contain at the altitude y. Therefore this quantity is

$$v\,\varepsilon \, . \, \frac{-\partial F}{\partial y} d\,y,$$

where $F(y)$ is the specific humidity of saturated air at the altitude y.

Still assuming a stationary condition, we have—

$$(14) \qquad W = -\int_{y_0}^{y'} v\,\varepsilon\, F'(y)\, d\,y,$$

as representing the total quantity of aqueous vapor condensed in a unit of time in a stratum of cloud above the unit of basal area between the altitudes y_0 and y'.

This would also be equal to the quantity of precipitation falling from that layer of cloud on to the unit of horizontal base in case the products of condensation simply fell vertically without being carried along by the horizontal current of air. We will make this assumption, since as yet we have no clue by which to frame a computation of the horizontal transportation of the falling particles of precipitation. It is, however, easy to foresee that the horizontal transportation would be of importance, especially for the slowly-falling particles of water or ice in the upper strata of clouds, and that on the other hand, the larger drops that carry down with themselves the water condensed in the lower strata of clouds will fall at a relatively slight horizontal distance. But now, as the numerical computation shows, the lower cloud strata contribute relatively far more to the condensation than the upper clouds; therefore, the influence of the horizontal transport will not be so very large, at least with moderate winds. Moreover, this influence does not affect the total quantity of precipitation caused by the flow up the mountain side, but only its distribution on the mountain slope and it consists essentially in a transfer of the location of maximum precipitation toward the mountain. In this sense, therefore, we have to expect a departure of the actual distribution of precipitation from that which is theoretically given by the computation of W as a function of x, according to equation (14). This departure will, under otherwise similar circumstances, be considerably larger in the case of snowfall than in the case of rain.

As concerns the upper limit y', which is to be assumed in the integration of equation (14) in order to obtain the total quantity of precipitation falling upon a unit of surface, we have to substitute for y' that altitude at which condensation actually ceases in the ascending current of air. Theoretically, if from the beginning adiabatic equilibrium prevails up to any given altitude, then the condensation brought about by the rising of the earth's surface must also extend indefinitely high, even to the limit of the atmosphere, since the vertical component of velocity diminishes asymptotically toward zero. But practically, our solution of the problem of flow no longer holds good for very high strata probably, and certainly the assumption of adiabatic equilibrium does not hold good, and even if the latter were the case, if therefore, the ascending current carried masses of air from the surface of the earth up to any given altitude, still, in consequence of the increasing weight of the particles of precipitation carried up by the ascending current on the one hand, and the increasing insolation on the other hand, an upper limit of cloud must be formed.[1]

We will therefore assume as given some such upper limit of clouds at a definite altitude, and for simplicity will assume this to be the same everywhere. The value of this altitude, y', is the upper limit of the integral (14). However, the altitude assumed for y' if it is large, namely, many thousands of meters, can have only a slight influence on the value of W, since both $-F'(y)$ and $v\varepsilon$ rapidly diminish with the altitude.

For the numerical computation of W, it is advantageous to first bring the expression (14) by partial integration into the following form:

$$(14a)\qquad W(x)=\Big[v\,\varepsilon\,F(y)\Big]_{y'}^{y_0}+\int_{y_0}^{y'}F(y)\frac{\partial\,\varepsilon\,v}{\partial\,y}\,dy.$$

In this expression v is given by equation (13) as a function of y and x. $F(y)$, or the saturation value of the specific moisture at the altitude y, as well as the corresponding values of the pressure and temperature necessary for the computation of ε are most easily obtained with the help of the graphic diagram for the adiabatic changes of condition of moist air first given by H. Hertz, since a simple analytical expression for these quantities can not be given. In using the Hertzian table[2] we have to remember that y is not the absolute altitude but the altitude above the axis of x in our system of coordinates, therefore, in order to obtain the altitude above sea level, it is still to be increased by the quantity $-\eta\,(x=-\frac{\lambda}{4})$ and also by the altitude of the valley above the sea. The integral in equation (14a) can be evaluated with sufficient accuracy by dividing the integral from y_0 to y' into parts $y_0 \ldots y_1$, $y_1 \ldots y_2$ $y_{h-1} \ldots y_h \ldots$ (where $y_h=y'$), and for each of these introducing an average value F_{mk} whereby we obtain equation (15).

$$(15)\qquad \int_{y_0}^{y_h}F(y)\frac{\partial\,(\varepsilon\,v)}{\partial\,y}\,d\,y=\sum_{0}^{h}{}_k\,F_{m_k}\Big[(\varepsilon\,v)_k-(\varepsilon\,v)_{k-1}\Big].$$

In order to execute the complete computation of W for a special example, we will assume that the current of air which strikes the mountain having the profile shown in fig. 1 has a pressure of 760 millimeters, temperature, 20°, and specific humidity, 9.0,[3] at the bottom of the valley. Hence, according to our assumption of adiabatic equilibrium it follows that the lower limit of the clouds will lie at an altitude of 950 meters above the bottom of the valley, and, therefore, 50 meters above the center of the mountain, if $y_0=500$; the specific humidity is at this cloud level, $F(y)'=9.0$, and the temperature is 11° C. We will further assume that the upper limit of the clouds is at an altitude of about 5,000 meters, or $y'=4{,}530$ meters, where the temperature has sunk to $-13.6°$ and the specific humidity to $F(y)=2.5$. At the altitude of 3,000 meters the temperature 0° C. is attained. The application of the Hertzian tables assumes that for temperature below 0° C. the product of condensation is ice; whether this is really true is at least questionable for moderately low temperatures, but the assumption that water below the freezing point is precipitated will not change the results very much. Since corresponding to the assumed stationary condition, we have to assume that all condensed water immediately falls from the clouds; therefore, in our computation we have to omit the hail stage of Hertz, in which the water that is carried along with the cloud is frozen[4].

For the computation of the integral according to equation (15) the cloud is divided into four layers whose mutual boundaries or limits occur at $y_1=1{,}530$, again $y_2=2{,}440$, and $y_3=3{,}460$ meters; for these altitudes we have $\varepsilon=1.00$ and 0.912 and 0.816, and corresponding to these $F(y)=6.9$ and 5.35 and 3.8.

We thus find the following values for W/a:

$x=$	0	$\pm\frac{\lambda}{12}$	$\pm\frac{\lambda}{8}$	$\pm\frac{\lambda}{6}$
$\frac{W}{a}=$	0.475	0.241	0.0985	0.0081 grams per second

per square meter.

From this table we obtain the depth of the precipitation in millimeters per hour by multiplying by 3.6; the result is shown in the lower curve of fig. 1. The values of the precipitation for a mean horizontal velocity of the current of 1 meter per second are as follows:

$x=$	0	$\pm\frac{\lambda}{24}$	$\pm\frac{\lambda}{12}$	$\pm\frac{\lambda}{8}$	$\pm\frac{\lambda}{6}$	$\pm\frac{\lambda}{4}$
$W'=$	1.71	1.47	0.867	0.355	0.029	0

[1] W. von Bezold. Sitzb. Ber. Akad. Wiss., Berlin, 1888, p. 518, and 1891, p. 303.

[2] H. Hertz. Met. Zeit., 1884. Vol., I pp. 421–431.

[3] That is, 9.0 grams of water per kilogram of air.

[4] The influence upon the adiabatics of condensation, whether we assume, as in the Hertzian table, all condensed water to be carried with it or to immediately fall away, is of no importance in the present problem.

Hence, the precipitation is heaviest above the middle of this slope of the mountain, where for the very moderate wind velocity of 7 meters per second, it attains the very considerable rate of 12 millimeters per hour. In this connection it is, indeed, to be remembered that we have assumed exceptionally favorable conditions for the precipitation in that we have assumed the onflowing air to have been already fully saturated throughout the whole 4,000 meters in depth of the layer between y_0 and y'.

The comparison of the curve of precipitation with the curve of profile in fig. 1 shows that although the maximum of precipitation coincides with the maximum gradient of the slope of the mountain, yet the depth of precipitation diminishes more slowly toward the plane of the valley and the plateau of the mountain than does the slope of the earth's surface; thus, for instance, the latter slope at the point where $x = \pm \lambda/12$, and which is given by $\partial \eta / \partial x$, amounts only to $1/20$ of the maximum slope, while the precipitation at this point is more than $1/5$ of its maximum value. Therefore, under the conditions here assumed, the effect of a mountain slope in producing precipitation makes itself felt in the plain lying in front of the foot of the slope. All of which agrees with actual experience[5]. The fact that in reality the maximum precipitation appears to be pushed more toward the ridge of the mountain is certainly partly explained, as well as suggested, by the horizontal transportation of the products of condensation in the clouds, but also in part by the departure of the real distribution of temperature and moisture from that here assumed. (See Section 4 hereafter.)

The determination of the total quantity of precipitation caused by the mountain slope will be attained if we integrate the value of W as determined by equation (14) as a function of x between the limits $x = -\lambda/4$ and $x = +\lambda/4$. The result is, therefore,

$$(16) \qquad G = \int_{-\frac{\lambda}{4}}^{+\frac{\lambda}{4}} W(x)\, d\, x = -\int_{y_0}^{y'} \varepsilon F'(y) \int_{-\frac{\lambda}{4}}^{+\frac{\lambda}{4}} v\, d\, x.$$

In this equation, according to equation (13) we have:

$$\int_{-\frac{\lambda}{4}}^{+\frac{\lambda}{4}} v\, d\, x = a \times 1{,}100 \left\{ e^{-n_1 y} - \frac{2}{9} e^{-n_3 y} + \frac{1}{25} e^{-n_5 y} \right\}.$$

For our present example we find $G = 5{,}100a$ grams per second over a strip 1 meter wide and about 22 kilometers long. Hence, there follows for the average precipitation for the whole mountain slope

$$W'_m = 0.833a \text{ millimeters per hour.}$$

3.

In the example we have just discussed the lower limit of the clouds was higher than the summit of the mountain. If the reverse is the case, then, for that portion of the mountain slope that is immersed in the clouds we must take η instead of y_0 as the lower limit of the integral in the formulæ (14) to (16); therefore, the theoretical distribution of precipitation would no longer be symmetrical with respect to the zero point on the axis of abscissas. As an example of this case we will consider the flow of air above the ground profile that is represented by the simple equation

$$\eta = C \sin m x . e^{-r\eta}.$$

As to the constants we will adopt the following:

$$C = 1{,}000 \text{ meters}, \qquad \lambda = 24{,}000 \text{ meters};$$
$$\text{hence } m = 0.262 \times 10^{-3}, \qquad r = 0.269 \times 10^{-3},$$

and for the vertical coordinate η we find from equation (5)

for $x =$	$-\frac{\lambda}{4}$	$-\frac{\lambda}{6}$	$-\frac{\lambda}{12}$	0	$+\frac{\lambda}{12}$	$+\frac{\lambda}{6}$	$+\frac{\lambda}{4}$	
$\eta =$	—1,495	—1,194	—585	0	+444	+715	+805	meters.

The resulting curve is shown in fig. 2. The altitude of the summit of the mountain above the plain of the valley amounts to 2,300 meters. The valley may be 100 meters above sea level; the atmospheric pressure in the valley is assumed at 750 millimeters, the temperature 23°, and the specific humidity 10 grams of water per kilogram of air. From the Hertzian table we find the lower cloud limit at the altitude of 1,220 meters, that is to say at $y = -375$. The upper limit of the clouds is assumed at $y' = 2{,}400$ and, therefore, at 4,000 meters above sea level. Therefore, for that portion of the clouds lying below the summit of the mountain, which is limited to the negative values of the abscissas up to $x = -1.35$ killimeters approximately, since according to equation (7)

$$v = C a m \cos m x . e^{-ny}$$

we have:

$$W = -\int_{y_0}^{y'} \varepsilon v F'' d y = -a C m \cos m x \int_{y_0}^{y'} \varepsilon F''(y) e^{-ny} d y$$
$$= a \cos m x \times 1.09.$$

Therefore, the depth of the precipitation will here be represented by a simple cosine curve and, in general, corresponds to the slope of the mountain, which is computed from equation (5′) by the expression:

$$\frac{d\eta}{dx} = \frac{C m \cos m x . e^{-r\eta}}{1 + C r \sin m x . e^{-r\eta}}.$$

For the region lying above the lower cloud limit y_0 the value of $W(x)$ can not be represented by a simple function of x. We find the precipitation in millimeters per second for a horizontal velocity $a = 1$, as follows:

For $x =$	—6	—5	—4	—3	—2	Lower half of the cloud.
$W'' =$	0	1.01	1.96	2.78	3.40	
For $x =$	—1	0	+2	+4	+6	In the cloud.
$W'' =$	3.50	2.94	1.95	0.88	0	

The distribution of precipitation, as given by these figures is shown in fig. 2 by the curve of dashes. The curve of dots represents the symmetrical line that would obtain if the mountain were not immersed in the clouds. The location of maximum precipitation is 3.93 for $x = 0$ and is 3.68 for $x = -6.3$.

The total quantity of precipitation is computed by the formula:

$$G = -a C \sin m x \int_{y_0}^{y'} \varepsilon F''(y) e^{-ny} d y$$

and is approximately equal to 22,730; this is distributed over a horizontal strip 12,000 meters in length, and therefore, for a uniform distribution for $a = 1$ the precipitation averages 1.9 millimeters.

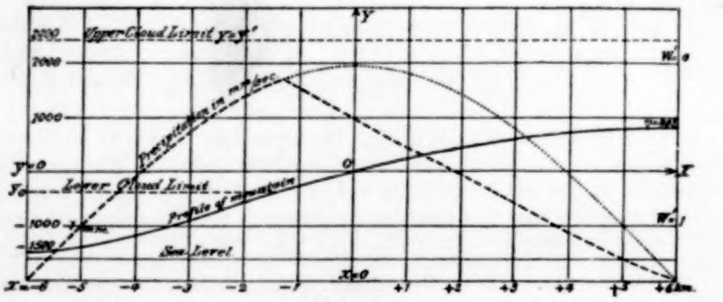

Fig. 2.

[5] Hann. Climatology, 2d edition, vol. 1, p. 295; also Assmann, Einfluss der Gebirge auf das Klimat von Mittel Deutschland, 1886, p. 373.

From the preceding expression for G, it is plain that for any given altitude of the mountain summit G will be smaller the shorter and steeper the slope becomes, that is to say, the smaller the value of λ is, since the exponent $n y$ increases with diminishing values of λ. In the present case the horizontal velocity of the wind is given by the expression:

$$u = \frac{\partial \varphi}{\partial x} = a\left(1 + C\frac{m^2}{n}\sin m\, x.\, e^{-ny}\right)$$

$$= a\,(1 + 0.332\ \sin\ m\ x.\, e^{-ny});$$

which attains its minimum, $= 0.547\,a$, at the bottom of the valley, and its maximum, $1.283\,a$, at the summit of the mountain, and has a for the mean value of all the horizontal planes. Above the center of the valley it increases gradually with altitude, asymptotically approaching its limiting value, a; for example, at the level $y = 0$, it is equal to $0.668\,a$, and at the level $y = 2{,}400$ it is already equal to $0.80\,a$. Therefore, if the stream under consideration proceeds from a point $x = -\lambda/4$, as a purely horizontal current of air flowing over a plain, then its velocity must diminish with the altitude in the ratio e^{-ny}. This would, of itself, be a plausible assumption, but there would then be a vortex motion for each horizontal current of air, which can not, strictly speaking, continue steadily in the above assumed potential motion.

4.

The assumptions hitherto made by us, namely, that the distribution of temperature in the current of air that impinges upon the mountain side already corresponds to the condition of indifferent equilibrium, that is to say that it is the same as would occur in an ascending current of air under adiabatic changes of condition, is in general not actually fulfilled. The scientific balloon ascensions at Berlin have recently given us reliable conclusions as to the real conditions of temperature and moisture in the free atmosphere up to altitudes of 8,000 meters. The mean values of the temperature and moisture at successive levels, 500 meters apart, which von Bezold has deduced[6] from the observations of Berson and Süring show that the mean vertical diminution of temperature is slower than the adiabatic, and that, in general, the moisture does not attain the saturation value. In a horizontal current of air, in which these average conditions prevail, the air will, therefore, never be saturated, and, consequently, our assumption of the existence of a constant lower limit to the clouds is not allowable. Moreover, it is no longer the vertical component alone that controls the condensation that shall occur at any given point in the current of air ascending above the mountain slope, as was assumed in the derivation of formula (14). We must rather, in the computation of W, consider that the quantity of water condensed in a unit of space under steady stationary conditions is equal to the excess of the quantity of water vapor flowing into the space above that simultaneously flowing out. For one cubic meter and one second this excess is:

$$-\left(\frac{\partial(\varepsilon\, u\, F)}{\partial x} + \frac{\partial(\varepsilon\, v\, F)}{\partial y}\right),$$

or since because of the equation of continuity we have approximately

$$\frac{\partial\, \varepsilon\, u}{\partial x} + \frac{\partial\, \varepsilon\, v}{\partial y} = 0,$$

therefore[7],

$$-\ \varepsilon\left(u\frac{\partial F}{\partial x} + v\frac{\partial F}{\partial y}\right),$$

and hence,

$$(17) \qquad W = -\int_{y^0}^{y'} \varepsilon\left(u\frac{\partial F}{\partial x} + v\frac{\partial F}{\partial y}\right) d\, y,$$

where y^0 and y' indicate the altitudes of the limits of the clouds above the point under consideration. The evaluation of the integral still demands not only a complete knowledge of the stream, but also the determination of the cloudy region, that is to say, that region in which the atmosphere is saturated and the distribution of temperature therein, since the latter first gives us the value of F. To this end we have to follow the adiabatic change of condition of the air around each curve of flow, starting with the given temperature and humidity in the vertical above the center of the valley where $x = -\lambda/4$, where the current is truly horizontal.

By connecting together those points in the individual stream lines at which saturation is just attained we find, first, the contour of the cloudy region.

Since the form of the clouds is also of interest in and of itself[8], therefore its determination will be carried through as a part of our second example, in that above the center of the valley, where $x = -\lambda/4$ first for the summer, then for the winter, we make some assumption as to the mean distribution of temperature in accordance with von Bezold's collected data, on page 21 of his memoir above quoted. In accordance with this, we have:

	For $y =$	$-1{,}500$	-600	$+400$	$+1{,}400$	$+2{,}400$ m.
		Valley above sea level, 100 m.				Height above sea level, 4,000 m.
Summer	$t =$	17.7°	11.0°	5.3°	+ 0.9°	− 5.0°
	$F =$	8.2	6.69	4.59	3.03	2.60*
Winter	$t =$	0.2°	−0.6°	−5.1°	−10.8°	−14.6°
	$F =$	2.92	2.17	1.64	1.19	0.86

In place of the value of F, designated by a star, we will take that value (2.2) that results from the smoothing out of the protuberant corners which the curve for F (see von Bezold, fig. 11) shows at the altitude of 4,000 meters.

According to equation 5 the lines of flow have for their expression

$$e^{-ny}\sin m\, x = -\frac{m}{b\, q\, n} + B\, e^{qy},$$

or if y_0 is the value of y when $x = 0$, and $y - y_0 = \eta$, there results,

$$e^{-n\eta}\, e^{-ny_0}\sin m\, x = \frac{m}{b\, q\, n}\left(e^{q\eta} - 1\right),$$

$$\frac{b\, n}{m}\, e^{-ny_0}\, e^{-r\eta}\sin m\, x = \frac{1}{q}\left(e^{\frac{q\eta}{2}} - e^{-\frac{qn}{2}}\right).$$

With the same degree of approximation as before the right-hand side of this equation can be put equal to η; therefore the equation takes the following form:

$$(18) \qquad \eta = b\frac{n}{m}\sin m\, x.\, e^{-r\eta}\, e^{-ny_0},$$

which differs from equation (5′) of the profile curve of the ground only through the factor which is constant for each line of flow, which factor causes the amplitude of the waves to steadily diminish upward.

If, now, the lines of flow are made through a definite point y'_h for the vertical and $x = -\lambda/4$, then for this point we de-

[6] W. von Bezold. Theoretische Betrachtungen, etc. Theoretical considerations relative to the results of the scientific balloon ascensions of the German Association for the Promotion of Aernautics at Berlin. Brunswick, 1900, pp. 18–21.

[7] In so far, namely, as the quantity of the aqueous vapor condensed in a unit of volume is inappreciably small in comparison with the total quantity of moist air flowing through this space.

[8] It seems, for example, quite possible to argue from the observed boundary of the clouds inversely to the percentage of moisture in the current of air flowing toward the mountain slope.

termine the appropriate value η' from the transcendental equation:

$$(19) \qquad \eta' = -b\frac{n}{m}e^{-r\eta'}e^{-n(y'_h - \eta')}$$

and then substitute $y^0_h = y'_h - \eta'$ in equation 18.

In this way we have computed the four lines of flow whose initial and lowest points are at the altitude above sea level of 1,000, 2,000, 3,000, and 4,000 meters, and which are drawn as curves I, II, III, IV, in fig. 3. The highest points of these curves are at the altitudes 2,940, 3,610, 4,333, 5,100 meters, respectively.

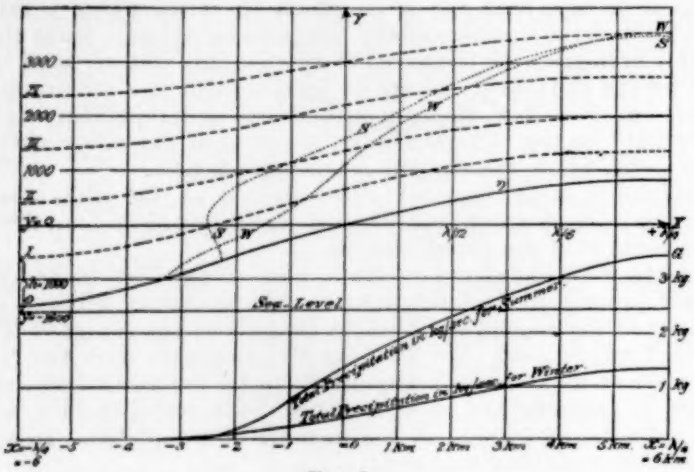

FIG. 3.

If now, by means of the Hertzian table, we determine the altitudes at which condensation begins at the base curve 0 and for the curves I, II, III, IV, then assuming the above given values of t and F,[9] we find the following results:

	0	I	II	III	IV
For the summer	930	1,570	2,730	4,060	(5,125)
For the winter	600	2,070	3,100	4,130	5,100

In the summer, according to this table, condensation will not take place on the stream line IV, since its summit lies at the altitude of 5,100 meters; the summit of the clouds will, therefore, lie a little below this. In the winter, the summit of line IV accidentally agrees with the summit of the cloud. In the construction of the cloud limit, introduced as a dotted line in fig. 3, and indicated by S for summer and W for winter, we have also used the lines of flow midway between 0 and I and I and II, respectively.[10]

We can now, with the help of the Hertzian table, easily find the quantity of water condensed in every kilogram of moist air as it progresses along any one of the lines of flow that we have constructed, either in its totality or as it passes successive vertical lines: we thus attain the following values of the total condensation:

Curve	0	I	II	III
For the summer	2.85	2.42	1.22	0.26 grams.
For the winter	1.5	0.74	0.34	0.14 grams.

[9] From the above numbers it follows that an elevation of any form of less than 500 meters will not give occasion for condensation under average atmospheric conditions neither in summer nor in winter. In the summer, for a mountain altitude of between 600 and 800 meters, a cloud will form between the altitudes 1,000 and 3,000 meters, but will not touch the mountain; it is only for greater mountain heights that the cloud will rest on the mountain.

[10] In an analogous way for the first example, where we have assumed a plateau-like mountain of 900 meters altitude, we find a region of cloud which, for the average summer conditions, begins at 40 meters below the summit of the plateau and reaches up to over 3,000 meters; but in winter, on the other hand, it begins at 500 meters above the valley and rises up only about 700 meters above the mountain top; therefore, in this season it covers the mountain like a flat cap.

Let $g_x(h)$ be the quantity condensed up to the abscissa x when moving along that line of flow whose initial point is at the altitude h, and let H be the initial altitude of that line of flow which at the given abscissa x intersects the upper cloud limit; moreover, let u' be the horizontal velocity of flow and ε' the density of the air at the altitude h above the bottom of the valley, therefore, for the point whose abscissa $= -\lambda/4$; then will the total quantity condensed per second above the base area one meter broad from the beginning of the clouds to the point x, expressed in grams, be as follows:

$$(20) \qquad G_x = \int_0^H \varepsilon' u' g_x(h)\,dh.$$

The quantity of air, εu kilograms, flows in one second through a strip of the vertical plane at $x = -\lambda/4$, having a unit width and the height dh; but an equal quantity must flow out per second through the vertical whose abscissa is x, and since the condition is steady, it therefore behaves as though the quantity of air, εu, had moved in one second along the line of flow from $-\lambda/4$ up to x; but in this the quantity of water $\varepsilon u g_x(h)$ is separated from the air according to our definition of g.

If we have computed G as a function of x, according to to formula (20), then, finally, we have

$$(21) \qquad W = \frac{\partial G}{\partial x}$$

as the quantity of water, expressed in grams, per horizontal square meter per second, that falls at the place x. In this way the determination of W is executed more conveniently than through the direct formula (17). By assuming the average conditions for the summer in the above example for $a = 1$, we find that the integral (20), if we compute it as approximately equal to the sum of the intervals between the individual current curves of flow as constructed, gives the following:

$$G_{x=0} = 1{,}352, \quad G_{x=\frac{\lambda}{8}} = 2{,}680, \quad G_{x=\frac{\lambda}{4}} = 3{,}460 \text{ grams.}$$

This last number indicates the total precipitation falling on a strip one meter wide in one second on the side of the slope that faces the wind. According to the course of the curve SS, as shown in fig. 3, the precipitation begins, first, in the neighborhood of $x = -0.108\lambda$ and therefore is distributed along a strip of the ground surface, whose length is 0.358λ, or 8,600 meters; from this we compute the average precipitation per hour, as follows:

$$\frac{3.6 \times 3{,}460}{8{,}600} = 1.45 \text{ mm.}$$

Similarly, we find for winter:

$$G_{x=0} = 380, \quad G_{x=\frac{\lambda}{6}} = 770, \quad G_{x=\frac{\lambda}{4}} = 1{,}264;$$

the total precipitation is distributed over a strip 9,400 meters long, so that the average precipitation is 0.485 millimeters per hour.

From the above three values of $G(x)$ we can graphically construct the course of this function approximately by considering that the tangent to the curve for G is horizontal at its initial point and when $x = +\lambda/4$.

The tangent to the slope of the curve is found by considering its measure W'. Thus we recognize in our case that the maximum of the precipitation in summer is attained between $x = 0$ and $x = -1$, but in winter between $x = 0$ and $x = +2$ kilometers and amounts to $a \times 2.2$ millimeters, or $a \times 0.75$ millimeters per hour, respectively, for a wind velocity of a meters at some very great altitude; furthermore, after

passing the summit of the mountain the precipitation diminishes more slowly than was found under our previous assumption of a constant thickness of clouds. In reality, on account of the conveying of the water or ice with the cloud, which we still neglect as before, the maximum of precipitation is pushed still more toward the summit of the mountain. Moreover, since one part of the cloud floats over the summit and is there dissipated in the sinking or descending currents of air, the precipitation will stretch a little beyond the summit, but its total quantity will be less than the computed.

The results of the preceding analysis, namely, that there exists a zone of maximum precipitation on the windward slope of a mountain and that the inclination of the surface of the earth is more important in determining the quantity of precipitation than is its absolute elevation, is conformed by observations, at least for the higher mountains."[11]

ON THE IONISATION OF ATMOSPHERIC AIR.

By C. T. R. Wilson, M. A., F. R. S., dated February 1, from the proceedings, Royal Society, Vol. LXVIII, pp. 151-161, May 4, 1901.

The present communication contains an account of some of the results of investigations undertaken for the Meteorological Council with the object of throwing light on the phenomena of atmospheric electricity.

In a paper[1] containing an account of the results arrived at during the earlier stages of the investigation I described the behavior of positively and negatively charged ions as nuclei on which water vapor may condense.

The question whether free ions are likely to occur under such conditions as would make these experimental results applicable to the explanation of atmospheric phenomena was left undecided in that paper. My first experiments[2] on condensation phenomena had, it is true, proved that in ordinary dust-free, moist air a very few nuclei are always present requiring, in order that water should condense upon them, exactly the same degree of supersaturation as the nuclei produced in enormously greater numbers by Röntgen rays, and I concluded that they are identical with them in nature and that they are probably ions[3]. While, however, later experiments proved that the nuclei formed by Röntgen or uranium rays can be removed by an electric field and are, therefore, ions; similar experiments made with the nuclei which occur in the absence of ionising radiation led to negative results[4]. In the light of facts brought forward in the present paper I should now feel disposed to attribute the negative character of the results in the latter case to the small number of nuclei present[5].

Subsequently to the publication of the work on the behavior of ions as condensation nuclei, Elster and Geitel showed that an electrified conductor exposed in the open air or in a room lost its charge by leakage through the air, and that the facts concerning this conduction of electricity through the air are most readily explained on the supposition that positively and negatively charged ions are present in the atmosphere. The question where and how these ions are produced remained, however, undetermined; it would, therefore, be incorrect to assume their properties, and in particular their behavior as condensation nuclei to be necessarily identical with those of freshly produced ions; the carriers of the charge might consist of much more considerable aggregates of matter than those attached to the ions with which the condensation experiments had been concerned. Moreover, so long as the source and conditions of production of these ions remained undetermined, one could not assume their presence in the regions of the atmosphere where supersaturation might be expected to occur.

Before going further afield in search of possible sources of ionisation of the atmospheric air, it seemed advisable to make further attempts to determine whether a certain degree of ionisation might not be a normal property of air, in spite of the somewhat ambiguous results given by the condensation experiments to which I have referred.

After much time had been spent in attempts to devise some satisfactory method of obtaining a continuous production of drops from the supersaturated condition, I abandoned the condensation method and resolved to try the purely electrical method of detecting ionisation. Attacked from this side, the problem resolves itself into the question: Does an insulated-charged conductor suspended within a closed vessel containing dust-free air lose its charge otherwise than through its supports when its potential is well below that required to cause luminous discharges?

Several investigators from the time of Coulomb onward have believed that there is a loss of electricity from a charged body suspended in air in a closed vessel in addition to what can be accounted for by leakage through the supports.[6] In recent years, however, the generally accepted view seems to have been that such leakage through the air is to be attributed to the convection of the charge by dust particles.

The experiments were begun in July, 1900, and immediately led to positive results. A summary of the principal conclusions then arrived at was given in a preliminary note "On the leakage of electricity through dust-free air," read before the Cambridge Philosophical Society on November 26. Almost simultaneously a paper by Geitel appeared in the Physikalische Zeitschrift[7] on the same subject, in which identical conclusions were arrived at in spite of great differences in the methods employed.

The following are the results included in the preliminary note, which I read:

1. If a charged conductor be suspended in a vessel containing dust-free air, there is a continual leakage of electricity from the conductor through the air.
2. The leakage takes place in the dark at the same rate as in the diffuse daylight.
3. The rate of leak is the same for positive as for negative charges.
4. The quantity lost per second is the same when the initial potential is 120 volts as when it is 210 volts.
5. The rate of leak is approximately proportional to the pressure.
6. The loss of charge per second is such as would result from the production of about twenty ions of either sign in each cubic centimeter per second in air at atmospheric pressure.

Of these conclusions the first four were also arrived at by Geitel.

As Geitel has pointed out, Matteuci[8] as early as 1850, had arrived at the conclusion that the rate of loss of electricity is independent of the potential. He had also noticed the decrease in the leakage as the pressure lowered.[9]

The volume of air used in my experiments was small, less than 500 cubic centimeters in every case, many of the measure-

[11] See Hann "Klimatologie," Vol. I, p. 298.

[1] Phil. Trans., A., vol. 193, pp. 289-308.

[2] Roy. Soc. Proc., vol. 59, p. 338, 1896.

[3] Camb. Phil. Sec. Proc., vol. 9, p. 337.

[4] Phil. Trans., A., vol. 193, pp. 289-308.

[5] The similar results obtained with nuclei produced in air exposed to ultraviolet light require, however, some other explanation.

[6] Perhaps the most convincing evidence of this is furnished by the experiments of Professor Boys, described in a paper on Quartz as an insulator. Phil. Mag., vol. 28, p. 14, 1889.

[7] Physikalische Zeitschrift, 2 Jahrgang, No. 8, pp. 116-119, published November 24.

[8] Annales de Chim. et de Phys., vol. 28, p. 385, 1850.

[9] This was also observed by Warburg, Annalen der Physik u. Chemie, vol. 145, p. 578, 1872.

ments being made with a vessel containing only 163 cubic centimeters. This made it much more easy to insure the freedom of the air from dust particles. Geitel worked with volumes amounting to about 30 liters; his observations show the interesting phenomenon of a gradual increase of the conductivity of the air in the vessel toward a limiting value, which was only attained when the air had been standing in the vessel for several days. This, as Geitel points out, is to be explained by the gradual settling of the dust particles, the conductivity of the air being greatest when there are no dust particles present to entangle the ions.

The principal difficulty in the way of obtaining a decisive answer to the question whether any leakage of electricity takes place through dust-free air is the fact that one is so liable to be misled by the leakage due to the insulating support. As will be seen from the description which follows, this source of uncertainty was entirely eliminated in the method which I adopted. It had, moreover, the advantage of reducing to the smallest possible value the capacity of the conducting system in which any loss of charge is measured by the fall of potential.

The conducting system, from which any leakage is to be detected and measured, consists solely of a narrow metal strip (with a narrow gold leaf attached to indicate the potential), fixed by means of a small bead of sulphur to a conducting rod which is maintained at a constant potential equal to the initial potential of the gold leaf and strip. With this arrangement, if any continuous fall of potential is indicated by the gold leaf, it can only be due to leakage through the air; any conduction by way of the sulphur head can only be in such a direction as to cause the leakage through the air to be underestimated.

The form of apparatus used in all the later experiments is indicated in fig. 1. [Omitted.] The gold leaf and thin brass strip to which it was attached were placed within a thin glass bulb of 163 cubic centimeters capacity; the inner surface of the bulb being coated with a layer of silver so thin that the gold leaf could readily be seen through the silvered glass. The upper end of the strip had a narrow prolongation, by means of which it was attached by a sulphur bead of about two millimeters in diameter to the lower end of the brass supporting rod. The latter passed axially through the neck of the bulb, its lower end just reaching to the point where the neck joined the bulb. The interior of the neck of the bulb was thickly silvered to secure efficient electrical connection between the thin silver coating of the inside of the bulb and a platinum wire sealed through the side of the tube. The platinum wire was connected to the earthed terminal of a condenser consisting of zinc plates embedded in sulphur, the other terminal of the condenser being connected to the brass supporting rod and maintaining it at a nearly constant potential. An Exner electroscope connected to the same terminal of the condenser was used to test the constancy of the potential, and any loss could from time to time be made up by contact with a rubbed ebonite rod or a miniature electrophorus.

Both the gold leaf of which the motion served to measure the leakage, which was the subject of investigation, and that of the Exner electrometer were read by means of microscopes provided with eye-piece micrometers.

To give the leaking system an initial potential equal to that of the supporting rod, momentary electrical connection between them was made by means of a magnetic contact maker. This consisted of a fine steel wire fixed to the supporting rod near its upper end and extending just below the sulphur bead, where it was bent into a loop surrounding the prolongation of the brass strip which carried the gold leaf. A magnet brought near the outside of the tube attracted the wire until the loop came in contact with the brass and brought it into electrical communication with the supporting rod. This operation was repeated every time the potential of the leaking system had fallen so far that the gold leaf approached the lower end of the scale. The potential of the supporting rod was not allowed to vary by more than a very few volts, and before each reading of the potential of the leaking system was always brought to within a fraction of a volt of its initial value; the Exner electroscope served to indicate when this was the case. The initial difference of potential used in most of the experiments amounted to about 200 volts.

To determine the fall in potential corresponding to a movement of the gold leaf through one scale division, a series of Clark cells was inserted between the condenser and its earth connection, and the number of scale divisions through which the gold leaf moved on reversing the Clark cells was determined; contact between the leaking system and its supporting rod being of course made before and after the reversal. The scale values of the Exner electrometer were determined similarly.

In the apparatus now described, a movement of the gold leaf of the leaking system through one scale division corresponded to a fall of potential ranging from 0.56 volt at the top of the micrometer scale to 0.60 volt at the bottom of the scale.

Any imperfection in the insulating power of the sulphur bead will, as we have seen, tend to give too low a value for the leakage. The error thus introduced was, however, found to be negligible; for the rate of fall of potential of the leaking system was sensibly the same when its potential was equal to that of the supporting rod as toward the close of an experiment when this difference was greatest.

The apparatus used in the earlier experiments differed in some respects from that which has just been described. The vessel was of brass, in the form of a short cylinder, 6 centimeters long and 5 centimeters in radius, the flat ends being vertical, each being provided with a rectangular window closed by a glass plate, so that the position of the gold leaf might be read. A purely mechanical contact maker was used instead of the magnetic one. With the voltage usually employed, a movement of the gold leaf over one scale division corresponded to a change of potential of 0.36 volt.

With this apparatus filled with air at atmospheric pressure (whether this had been filtered or had merely been allowed to stand for some hours in the apparatus), a continuous fall of potential of about 4.0 volts per hour occurred, showing no tendency to diminish even after many weeks. Contact had to be made with the supporting rod (kept as described at constant potential by means of the condenser), about once in twelve hours to prevent the image of the gold leaf from going off the scale of the microscope.

Although care had been taken to avoid bringing the apparatus, during or after its construction, into any room where radio-active substances had been used, it was considered desirable to repeat the experiments elsewhere than in the Cavendish Laboratory (where contamination by such substances might be feared), and with pure country air in the apparatus. Experiments were therefore carried out at Peebles during the month of September, but with the same results as before obtained.

The rate of leakage was the same during the night as during the day, and was not diminished by completely darkening the room in which the experiments were carried out. It is plainly, therefore, not due to the action of light.

It might be considered as possible that the conducting power of the air was due to some effect of the walls of the apparatus, related perhaps to the Russell[10] photographic effect and the nucleus-producing[11] effects of metals. These effects, however, are in the case of brass certainly very slight (I have

[10] Russell, Roy. Soc. Proc., vol. 61, p. 424, 1897; vol. 63, p. 102, 1898.
[11] Wilson, Phil. Trans., A, vol. 192, p. 431.

not been able to detect any cloud-nuclei arising from the presence of brass); they are enormously greater in the case of amalgamated zinc, yet the presence of a piece of amalgamated zinc in the apparatus was without effect on the rate of leak. If then the walls of the vessel influence in any way the ionisation of the air in the vessel, this influence is not proportional to the photographic or nucleus-producing effects of the metals.

To find the loss of electricity corresponding to the observed fall of potential of the leaking system, the condenser was removed, and the capacity of the Exner electroscope, with the connecting wires and the rod supporting the leaking system, was first determined by finding the fall of potential resulting from contact with a brass sphere of which the radius was 2.13 centimeters. The sphere, suspended by a silk thread, was in contact with a thin earth-connected wire, except when momentarily drawn aside by a second silk thread and brought into contact with the end of another thin wire leading to the electroscope. Except for these two wires the sphere was at a distance great compared with its radius from all other conductors. The rise of potential which occurred in the leaking system after a momentary contact with the system consisting of the supporting rod, electroscope and connecting wires was then compared with the simultaneous fall of potential of the latter system. The loss of electricity corresponding to a given fall of potential of the leaking system was thus obtained. It was found to be sensibly the same for potentials in the neighborhood of 100 volts as for the higher voltages (about 200 volts) generally used, the variations in capacity due to the change of position of the gold leaf being too small to be detected. The system had a practically constant capacity equal to 1.1 cubic meter.

It was possible now to compare the rates of leakage for different strengths of the electric field.

Brass apparatus used, air at atmospheric pressure.

Initial difference of potential.	Fall of potential per hour.
Volts.	*Volts.*
210	4.1
120	4.0

The leakage of electricity through the air is thus the same for a potential difference between the leaking system and the walls of the vessel of 210 volts as for one of 120 volts. On the view that the conduction is due to the continual production of ions throughout the air, this is easily explained as indicating that the saturation current has been attained; the field being sufficiently strong to cause practically all the ions which are produced to reach the electrodes; the number destroyed by recombination being negligible in comparison with those removed by contact with the electrodes. Thus under the conditions of the experiments the loss of electricity from the leaking system in a given time is, if the charge be positive, equal to the total charge carried by all the negative ions produced in the vessel in that time.

The sum of the charges of all the negative ions (or of all the positive ions) set free in the vessels is thus $1.1 \times 4.1/300$ electric units per hour, or 4.3×10^{-6} electric units per second. If we divide by 471 the volume of the vessel in cubic centimeters we obtain for the charge on all the ions of each sign set free in each cubic centimeter per second, 9.1×10^{-9} electric units. Finally, taking 6.5×10^{-10} electric units, the value found by J. J. Thomson, as the charge on one ion, we find that about 14 ions of each sign are produced in each cubic centimeter per second.

There are, however, two defects in the older form of apparatus, with which the above results were obtained, tending to make this number too small; first, the field in the corners where the flat ends meet the cylindrical wall must be very much weaker than elsewhere, and some of the ions set free in these regions may have time to recombine, although the strength of the field throughout most of the vessel is more than sufficient for "saturation;" second, since in this apparatus both the rod supporting the leaking system and the contact maker projected for about a centimeter into the interior of the vessel, a certain proportion of the ions set free would be caught by them and not by the leaking system.

These defects are avoided in the other apparatus which has been described, fig. 1, [omitted.]

In this apparatus the capacity of the leaking system was 0.73 cubic meters. The constant potential of the supporting rod, and thus the initial potential of the leaking system, was in all cases about 220 volts.

At atmospheric pressure the fall of the potential per hour was found to be 2.9 volts. The loss of charge was, therefore, $0.73 \times 2.9/300 = 7.1 \times 10^{-3}$ electric units per hour $= 2.0 \times 10^{-6}$ electric units per second. This is the total charge carried by all the positive ions, or by all the negative ions set free per second. The volume of the bulk being 163 cubic centimeters, the charge on the positive or negative ions set free per second in each cubic centimeter $= 2.0 \times 10^{-6} / 163 = 1.2 \times 10^{-8}$ electric units, and the number of ions of either sign set free per second in each cubic centimeter $= 1.2 \times 10^{-8} / 6.5 \times 10^{-10} = 19$. This is somewhat greater than the number obtained before, but, as was pointed out above, there were sources of error in the older apparatus tending to give too low a result for the rate of production of ions per cubic centimeter.

Experiments were now made on the variation of the rate of leak with pressure. The measurements were made at a temperature of about 15° C. Each experiment gave the leakage in a period varying from six to twenty-four hours. The silvered glass apparatus was used.

The following results were obtained:

Pressure in millimeters.	Leakage in volts per hour.	Leakage pressure.
43	0.22	0.0052
89	0.53	0.0058
220	1.14	0.0052
341	1.59	0.0047
533	2.30	0.0043
619	2.40	0.0039
635	2.65	0.0042
731	2.78	0.0038
743	2.99	0.0040

These numbers show that the leakage is approximately proportional to the pressure. While the pressure is varied from 43 milimeters to 743 milimeters, the ratio of leakage to pressure only varies between 0.0038 and 0.0058. Since the individual measurements of the leakage at a given pressure differed among themselves by as much as 10 per cent, it would hardly be safe until more accurate experiments have been performed to base any conclusions on the apparent departure from exact proportionality between leakage and pressure. From these results one would infer that it should be impossible to detect any leakage through air at really low pressures. This is in agreement with the observations of Crookes,[12] who found that a pair of gold leaves could maintain their charge for months in a high vacuum.

Experiments were now carried out to test whether the continuous production of ions in dust-free air could be explained as being due to radiation from sources outside our atmosphere, possibly radiation like Röntgen rays or like cathode rays, but of enormously greater penetrating power. The ex-

[12] Roy. Soc. Proc., vol. 28, p. 347, 1879.

periments consisted in first observing the rate of leakage through the air in a closed vessel as before, the apparatus being then taken into an underground tunnel and the observations repeated there. If the ionisation were due to such a cause, we should expect to observe a smaller leakage underground on account of absorption of the rays by the rocks above the tunnel.

For these experiments a portable apparatus had to be made, shown in fig. 2 [omitted]. It differed from that already described (fig. 1) in the following respects: The vessel of thinly silvered glass as before, was inverted and attached directly to the sulphur condenser, its neck being imbedded in the sulphur. The electroscope formerly used to test the consistancy of the potential of the supporting rod was dispensed with; all need for external wires was thus removed. Only the end of the wire by which the charge was put into the condenser protruded from the sulphur, and this was covered as shown in the figure, except at the moment of charging, by a small bottle containing calcium chloride; this fitted tightly on a conical projection of the sulphur through the center of which the wire passed. The sufficient constancy of potential of the supporting rod under these conditions was shown by the fact that when it had been put, by means of the magnet, in momentary electrical connection with the leaking system a second contact, made twenty-four hours later, caused the gold leaf, which indicated the potential, to return to within two micrometer scale divisions of its position immediately after the first contract. The change in the potential of the leaking system produced by such a change in the potential of the support was much too small to be detected.

The experiments with this apparatus were carried out at Peebles. The mean rate of leak when the apparatus was in an ordinary room amounted to 6.6 divisions of the micrometer scale per hour. An experiment made in the Caledonian Railway tunnel near Peebles (at night after the traffic had ceased) gave a leakage of 7.0 divisions per hour, the fall of potential amounting to 14 scale divisions in the two hours for which the experiment lasted. The difference is well within the range of experimental errors. There is thus no evidence of any falling off of the rate of production of ions in the vessel, although there were many feet of solid rock overhead.

It is unlikely, therefore, that the ionisation is due to radiation which has traversed our atmosphere; it seems to be, as Geitel concludes, a property of the air itself.

The experiments described in this paper were carried out with ordinary atmospheric air, which had in most cases been filtered through a tightly fitting plug of wool. The air was not dried and no experiments have yet been made to determine whether the ionisation depends on the amount of moisture in the air.

It can hardly be doubted that the very few nuclei which can always be detected in moist air by the expansion method, provided the expansion be great enough to catch ions, are themselves ions merely made visible by the expansion, not, as some former experiments seemed to suggest, produced by it. The negative results then obtained, in attempts to to remove the nuclei by a strong electric field, may, perhaps, be explained if we consider that all ions set free in the interval during which the supersaturation exceeds the value necessary to make water condense upon them, are necessarily caught, so that complete absence of drops is not to be expected even with the strongest fields.

The principal results arrived at in this investigation are (1) that ions are continually being produced in atmospheric air (as is proved also by Geitel's experiments), and (2) that the number of each kind (positively and negatively charged) produced per second in each cubic centimeter amounts to about twenty.

CLIMATOLOGY OF COSTA RICA.

Communicated by H. PITTIER, Director, Physical Geographic Institute.

TABLE 1.—*Hourly observations at the Observatory, San Jose de Costa Rica, during April*, 1901.

Hours.	Pressure. Observed, 1901.	Pressure. Normal, 1889-1900.	Temperature. Observed, 1901.	Temperature. Normal, 1889-1900.	Relative humidity. Observed, 1901.	Relative humidity. Normal, 1889-1900.	Rainfall. Observed, 1901.	Rainfall. Normal, 1889-1900.	Rainfall. Duration, 1901.
	660+ *Mm.*	660+ *Mm.*	° *C.*	° *C.*	%	%	*Mm.*	*Mm.*	*Hrs.*
1 a. m.	4.33	3.84	17.01	17.37	80	84	0.0	0.6	0.00
2 a. m.	4.99	3.47	16.68	17.13	79	85	0.0	0.2	0.00
3 a. m.	3.74	3.23	16.60	16.93	80	85	0.0	0.0	0.00
4 a. m.	3.72	3.21	16.38	16.82	81	84	0.0	0.3	0.00
5 a. m.	3.90	3.44	16.17	16.73	81	84	0.0	0.1	0.00
6 a. m.	4.03	3.79	16.24	16.80	80	84	0.6	0.1	0.67
7 a. m.	4.52	4.21	18.11	18.56	73	79	0.2	1.2	0.25
8 a. m.	4.75	4.52	20.58	20.68	63	70	0.0	1.2	0.00
9 a. m.	4.86	4.66	22.67	22.59	56	64	0.0	0.2	0.00
10 a. m.	4.77	4.56	24.63	24.53	50	56	0.0	1.2	0.00
11 a. m.	4.52	4.35	25.07	25.32	49	52	0.0	0.1	0.00
12 m.	4.00	3.92	26.34	25.94	47	55	0.0	0.7	0.00
1 p. m.	3.54	3.30	26.55	26.20	48	55	0.0	1.6	0.00
2 p. m.	3.12	2.81	26.38	25.36	50	59	0.0	3.2	0.00
3 p. m.	2.86	2.55	25.18	23.98	55	63	0.0	8.1	0.00
4 p. m.	2.81	2.52	23.63	22.54	60	68	0.0	4.9	0.00
5 p. m.	3.01	2.72	21.84	21.30	67	73	0.0	5.9	0.00
6 p. m.	3.97	3.19	24.40	20.11	72	76	0.0	4.4	0.00
7 p. m.	3.83	3.65	19.54	19.24	76	81	0.0	3.7	0.00
8 p. m.	4.34	4.03	18.94	18.80	79	82	0.0	2.1	0.00
9 p. m.	4.53	4.35	18.52	18.45	77	83	0.0	1.3	0.00
10 p. m.	4.98	4.64	18.12	18.07	78	84	0.0	1.2	0.00
11 p. m.	4.99	4.60	17.71	17.74	79	85	0.0	1.5	0.00
Midnight	4.74	4.29	17.24	17.53	80	85	0.0	0.7	0.00
Mean	664.08	663.75	20.47	20.36	68	74	......	......	......
Minimum	661.20	660.43	12.3	10.8	......	......	......	......	......
Maximum	666.60	667.12	32.5	34.7	......	......	0.6	8.1	......
Total	......	......	......	......	......	......	0.8	42.8	0.92

REMARKS.—The barometer is 1,169 meters above sea level. Readings are corrected for gravity, temperature, and instrumental error. The dry and wet bulb thermometers are 1.5 meters above ground and corrected for instrumental errors. The hourly readings for pressure, wet and dry bulb thermometers, are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The hourly rainfall is as given by Hottinger's self-register, checked once a day. The standard rain gage is 1.5 meters above ground.

TABLE 2.

Time.	Sunshine. Observed, 1901.	Sunshine. Normal, 1889-1900.	Cloudiness observed, 1901.	Temperature of the soil at depth of— 0.15 *m.*	0.30 *m.*	0.60 *m.*	1.20 *m.*	3.00 *m.*
	Hours.	*Hours.*	%	° *C.*	° *C.*	° *C.*	° *C.*	° *C.*
7 a. m.	8.50	13.16	44	22.44	22.83	23.03	21.75	20.96
8 a. m.	23.25	21.78						
9 a. m.	23.82	22.14						
10 a. m.	22.80	21.84	47	22.92	22.91	23.07	21.86	....
11 a. m.	20.88	21.58						
12 m.	21.59	20.09						
1 p. m.	22.84	19.81	53	23.79	23.25	23.13	21.85	....
2 p. m.	22.50	19.25						
3 p. m.	20.43	15.80						
4 p. m.	17.34	13.34	60	23.92	23.35	23.11	21.77	....
5 p. m.	12.74	9.86						
6 p. m.	5.51	4.95						
7 p. m.	....	....	52	23.60	23.32	23.06	21.74	....
8 p. m.	....	....						
9 p. m.	....	....						
10 p. m.	....	....	34	23.30	23.22	23.03	21.73	....
11 p. m.	....	....						
Midnight	....	....						
Mean	....	....	48	23.35	23.19	23.09	21.80	20.96
Total	222.20	205.59	....	....	....	....	....	....

Notes on the weather.—During the first seven days of the month there were protracted calms and other indications of an early beginning of the rainy season, but on the 8th the northeast monsoons began to blow again permanently, with a high relative pressure of the air until the 17th, inclusive. The 18th and 19th were close and warm, with threats of rain

in the afternoon. From the 20th to 30th the weather was windy and cloudy, with daily rains in the northern range of the Cordillera. The short shower on the 21st, at San Jose, had no action whatever on the soil, which remains unusually dry and dusty. On the Atlantic slope the first half of the month was pretty dry, with only occasional showers; the second half rather wet.

Earthquakes.—April 13, slight tremors at 4h. 42m. p. m. April 16, 1h. 23m. p. m., strong shock, northwest to southeast; duration, 5 seconds; intensity, 2. April 30, 3h 33m. p. m., slight tremors.

TABLE 3.—*Rainfall at stations in Costa Rica*, 1901.

Stations.	January.		February.		March.		April.	
	Amount.	No. rainy days.	Amount.	No. rainy days.	Amount.	No. rainy days.	Amount.	No. rainy days.
	Mm.		*Mm.*		*Mm.*		*Mm.*	
1. Boca Banano	265	17	98	11	278	14	219	16
2. Limon	304	19	72	9	214	15	193	12
3. Swamp Mouth	......	......	131	10	241	13	302	11
4. Zent	......	......	......	......	......	......	246	14
5. Gute Hoffnung	411	15	106	14	224	12	235	11
6. Siquirres	406	10	45	4	160	8	......	......
7. Guapiles	340	13	114	8	......	......	221	7
8. Sarapiqui	......	......	......	......	......	......	243	19
9. San Carlos	301	19	67	14	96	13	110	13
10. Las Lomas	521	16	131	10	181	14	66	4
11. Peralta	335	11	65	4	190	13	150	9
12. Turrialba	......	......	......	......	......	......	85	10
13. Juan Vinas	159	14	40	10	12	6	50	8
14. Santiago	......	......	......	......	......	......	66	9
15. Paraiso	......	......	......	......	......	......	......	......
16 San Rafael C	......	......	......	......	......	......	......	......
17. Tres Rios	2	1	5	1	0	0	2	1
18. La Palma	......	......	......	......	......	......	......	......
19. S. Francisco G.	7	2	9	1	26	1	1	1
20. San Jose	4	2	9	1	24	1	1	1
21. La Verbena	......	......	5	2	6	2	1	1
22. San Isidro Alajuela	0	0	1	1	......	......	8	1
23. Nuestro Amo	......	......	11	2	50	3	0	0
24. Sipurio	......	......	......	......	149	12	229	13

TABLE 4.—*Zent (station of the United Fruit Company), April*, 1901.

		7 a. m.	1 p. m.	6 p m.	Mean.
Temperature (degrees)		22.27	28.86	25.58	25.73
Relative humidity (per cent)		90	69	84	79
Cloudiness (per cent)		53	59	60	58
Temperature of the soil (degrees)	0.15 m.	27.38	27.32	27.66	27.46
	0.30 m.	27.43	27.35	27.43	27.39
	0.60 m	27.69	27.67	27.63	27.66

Sunshine.

Hours a m.	6-7	7-8	8-9	9-10	10-11	11-12	Total.
Per cent	0.54	12.48	15.91	16.44	16.63	14.67	....
Hours p m.	12-1	1-2	2-3	3-4	4-5	5-6	
Per cent	15-17	14.26	13.30	10.35	5.31	0.0	135.06

MONTHLY STATEMENT OF AVERAGE WEATHER CONDITIONS FOR APRIL.

By Prof. E. B. GARRIOTT.

The following statements are based on average weather conditions for April, as determined by long series of observations. As the weather of any given April does not conform strictly to the average conditions, the statements can not be considered as forecasts:

In the middle latitudes of the North Atlantic Ocean west of the thirtieth meridian storms are less frequent, while to the eastward of the thirtieth meridian and between the fortieth and sixtieth parallels storms are more frequent than during the preceding three months. There is an increase in the number of foggy days from the Grand Banks to the coast of the United States, and icebergs are likely to be encountered near Newfoundland and the Grand Banks as far south as the forty-first parallel, and possibly to the fortieth parallel.

In the West Indies April is the last month of what is generally termed the dry season. The wet season, which begins in May, continues through October.

Although the well-marked wet season of the Pacific coast of the United States extends from October to March, the monthly rainfalls gradually diminish from December and January to July and August. The latter two months named cover a practically rainless period in that section. Over the interior of the United States a large proportion of the more important storms of April develop on the middle-eastern slope of the Rocky Mountains, and move thence north of east over the Lake region and New England. On the Great Lakes and along the middle Atlantic and New England coasts the near approach of a storm of this type is indicated by rapidly-falling barometer and increasing east to south winds.

In the trucking districts of the interior of the Gulf and South Atlantic States damaging frost is likely to occur in April. Frost is likely to occur in the early part of the month in the Pacific Coast States, in the region immediately bordering the Gulf of Mexico, and in the north half of the Florida Peninsula.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Manuel E. Pastrana, Director of the Central Meteorologic-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the Boletin Mensual. An abstract, translated into English measures, is here given, in continuation of the similar tables published in the MONTHLY WEATHER REVIEW since 1896. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published in our Chart IV.

Mexican data for April, 1901.

Stations.	Altitude.	Mean barometer.	Temperature. Max.	Temperature. Min.	Temperature. Mean.	Relative humidity.	Precipitation.	Prevailing direction. Wind.	Prevailing direction. Cloud.
	Feet.	*Inch.*	°*F.*	°*F.*	°*F.*	%	*Inch.*		
Leon (Guanajuato)	5,901	24.26	89.1	45.7	69.3	31	0.03	nw.	sw.
Linares (Nuevo Leon)	1,188	28.62	102.2	50.0	76.3	58	1.34	s.	s.
Mazatlan	25	29.87	79.0	60.4	70.3	76	......	nw.	sw.
Mexico (Obs. Cent.)	7,472	23.02	84.2	44.8	64.8	41	0.53	nw.	sw.
Morelia (Seminario)	6,401	23.93	83.7	49.6	65.8	47	0.35	s.	w.
Puebla (Col. Cat.)	7,125	23.36	84.0	50.0	67.5	43	0.40	e.	wsw.
Saltillo (Col. S. Juan)	5,399	24.73	87.8	42.8	65.1	63	2.16	ne.	s.
S. Isidro (Hac. de Gto)	......	......	77.9	64.4	......	......	0.08	ne., w.	....
Zapotlan (Seminario)	5,078	25.04	89.6	49.6	70.7	63	......	sse.	w.

RECENT PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined list of titles has been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau:

Popular Science Monthly. New York. Vol 59.
Cook, F. A. Aurora Australis. Pp. 21-33.

Scientific American. New York. Vol. 84.
— Hofman's Flying Machine. P. 281.
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— Heinrich Suter's Airship. P. 21203.
Journal of the Franklin Institute. Philadelphia. Vol. 151.
Balch, E. S. Antarctica: A History of Antarctic Discovery. Pp. 321-341.
Nature. London. Vol. 63.
Gregory, J. W. Work of the National Antarctic Expedition [Program of]. Pp. 609-612.
Pearson's Magazine. London. Vol. 11.
Tindal, Marcus. The Kite Craze. Pp. 497-505.
Memorias y Revista, Sociedad Cientifica "Antonio Alzate." Mexico. Tomo 15.
Moreno y Anda, M. Datos para contribuir al estudio Climatologico del valle de Mexico: La variabilidad interdiurna media de la temperatura en Tacubaya. Pp. 189-200.
Science. New York. N. S. Vol. 13.
Clayton, H. H. Clayton's Eclipse Cyclone and the Diurnal Cyclones. Pp. 747-750.
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Zahm, A. F. Resistance of the Air at Speeds below One Thousand Feet a Second. Pp. 530-535.
Villari, Emilio. How Air subjected to X-rays loses its Discharging Property, and how it produces Electricity. Pp. 535-538.
Barus, C. Change of Colors of Cloudy Condensation with the Number of Available Nuclei, and on the Effect of an Electric Field. Pp. 572-579.
Majorana, Quirino. Relative Luminous Intensities of Sun and Sky. Pp. 555-562.
Ciel et Terre. Bruxelles. 21me année.
Arctowski, H. Sur les variations périodiques des aurores australes observées à bord de la *Belgica.* Pp. 79-91, 113-124.
Wolfer, A. Les centres principaux de l'activité solaire. Pp. 105-112.
Journal of School Geography. Vol. 5.
Hubbard, George D. Meteorologic conditions of the South Polar Regions. Pp. 161-170.
Quarterly Journal of the Royal Meteorological Society. London. Vol. 27.
Williams, C. Theo. Climate of Norway and its Factors. Pp. 105-115.
— Dew Ponds. Pp. 115-116.
Mawley, Edward. Report on the Phenological Observations for 1900. Pp. 117-140.
Watson, A. E. Review of Past Severe Winters in England, with Deductions therefrom. Pp. 141-151.
La Nature. Paris. 29me année.
Molina, F. Les tirs contre la grêle. Pp. 371-374.
Annuaire de la Société Météorologique de France. Tours. 49me année.
Angot, A. La température à Paris pendant les cinquante années 1851-1900. Pp. 57-60.
Goutereau, Ch. Sur le régime des vents forts à Nice. Pp. 61-63.
Annalen der Physik. Leipzig. Vierte folge. Band 4.
Schultze, Hugo. Die innere Reibung von Argon und ihre Aenderung mit der Temperatur. Pp. 140-165.
Breitenbach, Paul. Ueber die innere Reibung der Gase und deren Aenderung mit der Temperatur. P. 166-169.
Gaea. Leipzig. 37 Jahrg.
Klein, H. J. Ein neuer Wetterprophet. Pp. 351-354.
Comptes Rendus. Paris. Tome 132.
Bertainchand, E. Sur les poussières atmosphériques observées à Tunis, le 10 mars 1901. Pp. 1153-1155.
Meteorologische Zeitschrift. Band 18. Wien.
Polis, P. Beiträge zur Gewitterkunde im Hohen Venn und der Eifel. P. 97-106.
Koppen, W. Versuch einer Klassifikation der Klimate, vorzugsweise nach ihren Beziehungen zur Pflanzenwelt. P. 106-120.
Messerschmitt, J. B. Ueber die Halophänomene. P. 120-131.
— Vereinsnachrichten. Pp. 131-133.
— Seeland, Ferdinand. P. 133.
Obermayer, A. v. Peter Lechner. P. 133.
— Pilot Charts of the North Atlantic and Mediterranean. P. 134.
Hergesell, —. Vorläufige Mittheilung über die internationale Ballonfahrt vom 7 Februar 1901. P. 134.
Hergesell, —. Vorläufige Mittheilung über die internationale Ballonfahrt vom 7 März 1901. P. 172.
Pernter, J. M. Hagelschäden trotz Wetterschiessens. P. 135.
Hann. Möglichkeit einer telephonischen Verständigung mittelst eines auf den Schnee gelegten Leitungsdrahtes. P. 136.
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— Vorläufige Berichte über die Staubfälle am 10 März. P. 138.
Hellmann, G. Vorläufige Mittheilung über den Staub-Regenfall in Norddeutschland am 11 März 1901. P. 138.
— Ein Signalapparat für ferne Gewitter. P. 139.
— Eine neue Studie über Meteorologie während der Sonnenfinsterniss. P. 140.
Hellmann, G. Die Entwickelung der meteorologischen Beobachtungen bis zum Ende des 17 Jahrhunderts. Pp. 145-157.
Klein, Hermann J. Cirrus-Studien. Pp. 157-172.
Rona, S. Bemerkungen zu dem Staubfall im März. P. 173.
Angstrom, Knut. Intensität der Sonnenstrahlung in verschiedenen Höhen, nach Untersuchungen auf Teneriffa 1895 und 1896. P. 174.
Groneman, H. J. H. Kappenbildung bei Cumuli. P. 176.
— Die Meteorologische Abtheilung der 72 Versammlung Deutscher Naturforscher und Aerzte zu Aachen in den Tagen vom 17-22 September 1900. P. 177.
Kesslitz, W. Starke Luftdruckschwankung, beobachtet in Pola am 14 Januar 1901. P. 180.
Chabot, J. J. Taudin. Grünstrahlung bei Sonnenaufgang. P. 181.
Krebs, W. Atmosphärische Optik im Elsass 2. F. 181.
Pernter, J. M. Sonnenhof (Kranz). P. 183.
Fischbach, K. v. Der Wald als Quellenspender. P. 183.
Wolfer, A. Provisorische Sonnenflecken-Relativzahlen für das 1 Quartal 1901. P. 185.

OBSERVATIONS AT HONOLULU.

Through the kind cooperation of Mr. Curtis J. Lyons, Meteorologist to the Government Survey, the monthly report of meteorological conditions at Honolulu is now made partly in accordance with the new form, No. 1040, and the arrangement of the columns, therefore, differs from those previously published.

Meteorological Observations at Honolulu, April, 1901.

The station is at 21° 18′ N., 157° 50′ W.
Hawaiian standard time is 10h 30m slow of Greenwich time. Honolulu local mean time is 10h 31m slow of Greenwich.
Pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.
The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.
The rainfall for twenty-four hours is measured at 9 a. m. local, or 7.31 p. m., Greenwich time, on the respective dates.
The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet, and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m. Greenwich time, or 2:30 a. m. Honolulu time.									Total rainfall at 9 a. m., local time.
				Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.		
		Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.	Minimum.	
	*	†	†			‡	‡		§				
1	30.07	74	67.5	82	67	66.5	73	e-sw.	1	3-8	30.11	29.97	0.04
2	30.04	73	65.5	81	73	64.7	69	ne.	4	5	30.10	30.00	0.01
3	30.02	72	65.7	79	70	64.3	72	n-nne.	3-1	5-10	30.10	29.99	0.04
4	30.07	72	65	79	70	62.3	66	ne.	4	3	30.09	30.00	0.00
5	30.08	72	65	78	70	61.7	65	ne.	5	3	30.13	30.04	0.00
6	30.03	73	65.5	78	71	62.3	67	ne.	4-2	5-10	30.13	30.04	0.03
7	30.02	66	64.7	80	71	65.0	75	ne-se.	3-0	5-10	30.08	29.99	0.24
8	29.97	64	63.3	79	64	64.5	77	s-w-ne.	0-1	8	30.04	29.91	0.01
9	29.97	66	65	80	63	65.3	82	se-n.	2-0	4-9	30.03	29.91	0.72
10	29.98	74	68	79	64	64.5	77	nne.	1	10	30.03	29.93	0.08
11	30.00	73	66.5	79	68	65.0	73	ene.	3	10-6	30.06	29.98	0.05
12	30.02	72	66.5	80	72	64.3	68	ne.	3-5	6-10	30.08	30.00	0.09
13	29.99	72	66.5	79	71	64.3	72	ne.	4	6	30.07	29.97	0.20
14	30.01	68	66	79	70	65.0	72	ne.	3	4	30.06	29.99	0.43
15	29.99	72	66	80	68	64.5	77	ne.	2	8-3	30.07	29.97	0.22
16	30.02	72	66	78	69	64.3	75	ne.	3	8-3	30.07	29.98	0.25
17	30.02	72	63.5	78	70	63.0	70	ne.	3-5	4	30.09	30.02	0.06
18	30.03	72	66	78	71	60.5	62	ne.	5	2	30.09	30.00	0.00
19	29.97	68	64	79	71	60.3	62	ne-nne.	4-2	3	30.08	29.98	0.01
20	29.99	66	64	80	63	63.0	73	ne.	2-0	3-0	30.04	29.94	0.00
21	29.96	63	61.7	79	65	63.3	77	sw-n.	1-0	4-8	30.03	29.95	0.03
22	29.87	65	63.7	80	62	62.5	76	sw.	0-2	7-1	29.96	29.88	0.00
23	29.84	66	64	80	63	63.5	76	sw-n.	0-1	1	29.89	29.80	0.00
24	29.92	71	65	82	64	64.0	73	sw-ne.	0-2	5	29.98	29.88	0.00
25	29.99	71	63.5	81	68	62.0	65	nne.	2	3	30.02	29.92	0.00
26	29.95	71	64	79	70	59.7	62	nne.	4-2	2	30.04	29.93	0.00
27	29.89	72	66.5	79	70	62.0	68	nne.	3	4	29.96	29.89	0.00
28	29.88	67	65	80	69	65.0	72	ene.	2	5-10	29.96	29.88	0.60
29	29.92	64	63.3	77	63	63.5	77	w-ne.	1	10	29.93	29.87	0.00
30	29.99	68	66.5	80	64	65.0	79	sw-n.	1-0	8	30.03	29.95	0.00
Sums.	......	......	......	......	......	......	......	......	......	......	......	......	3.11
Means.	29.983	69.7	65.2	79.5	67.8	63.5	72.0	......	2.3	5.4	30.045	29.958	......
Departure.	—.021	......	......	......	......	+0.2	+0.5	......	......	+0.3	......	......	+0.3

Mean temperature for April, 1901 (6 + 2 + 9) ÷ 3 = 73.0; normal is 72.8. Mean pressure for April, 1901 (9 + 3) ÷ 2 = 29.999; normal is 30.020.
*This pressure is as recorded at 1 p. m., Greenwich time. †These temperatures are observed at 6 a. m., local, or 4.31 p. m., Greenwich time. ‡These values are the means of (6 + 9 + 2 + 9) ÷ 4. §Beaufort scale.

THE CLIMATOLOGY OF ANTIGUA, W. I.

By WILLIAM H. ALEXANDER, dated April 16, 1901.

The island of Antigua lies to the eastward of St. Kitts in latitude 17° 5' north, longitude 61° 50' west. It contains an area of 108 square miles and is circular in form, being some 70 miles in circumference. The coasts are indented by numerous bays and, being high and rocky, are quite dangerous to navigation. The surface of the island is level, in the main; the highest point, McNish Mountain, is only 2,200 feet above sea level. The hills are probably less than 1,500 feet in elevation. Owing to a light rainfall the elevated portions of the island are not clothed with that luxuriant tropical vegetation to be seen in other of the Leeward Islands such as St. Kitts, Montserrat, and Dominica, but present to the eye a rather desolate, uninviting appearance. The valleys, however, stand in marked contrast to the hills, being arrayed in all the beauty and vernal richness of a tropical climate. There are no rivers and but few springs, and these are brackish. The people are dependent upon rainfall for a water supply, and have in former times suffered great loss and inconvenience from droughts. About one-third of the land is suitable for agricultural purposes.

As regards its geological structure, and in accordance with the character of its surface, it may be divided into three portions. In these three divisions marked contrasts are exhibited in their geological relations. On one side, the western, the rocks are of an igneous character, denoting violent action, akin to volcanic, but without actual eruption; on the other side, the eastern, the character of the rocks is totally different, being chiefly calcareous freestone and limestone; in the middle space, which is a plain, bordered on both sides by hills, both kinds of action may be said to be exhibited, the former in the indurated clays and silicious cherts, the latter in the numerous petrifactions (wood and coral) imbedded in its soil.

The soils of the island are not less varied than its rocks; stiff clays may be considered as predominating in the western division, lighter ones and calcareous marls in the eastern and middle. These are generally productive, especially the marls, of extraordinary fertility.—*C. A. Harris.*

The climate of Antigua for a tropical one is decidedly healthful, and excepting for the hot months is most agreeable. The remarkable dryness of the atmosphere renders it highly favorable for people subject to chest diseases, which are almost unknown among Antiguans. The prevailing diseases of the island are confined almost entirely to the blacks and may be attributed to uncleanly habits, bad diet, and neglect.

St. Johns, the principal town of the island, has a population of about 9,500, and is situated upon the northwest coast. The town covers an area of 150 acres of land and is built upon a slight declivity toward the sea. It is not only the seat of the island government but of the general government of the Leeward Islands as well. The population of the island in 1881 was 34,964, and the probabilities are that the present population differs very little from that figure.

The agriculturist is mainly engaged in the cultivation of the sugar cane from which he obtains sugar, molasses, and rum. The average sugar crop is about 12,000 hogsheads. The soil is very suitable for the growing of cane, which lives and thrives even under the most adverse circumstances. The laborers, when they can get the ground, cultivate for their own use small crops of yams, potatoes, guinea corn, etc. The wages of a field laborer vary to some extent, but generally are between 16 and 20 cents per day for a man; for a woman 12 to 16 cents per day is the usual pay. Domestic servants are paid $4 to $8 per month for a man, and $2.40 to $4.80 for a woman. Mechanics get from 36 to 48 cents per day. On account of the low wages and the limited demand for laborers, especially field laborers, there has been a steady emigration from the island of late years.

For more than ten years Mr. Francis Watts, chemist and government analyst for the Leeward Islands, has kept at Antigua, in connection with his other work, a complete series of meteorological records and has now kindly placed the same at my disposal. Mr. Watts being not only a scientific man but a close student of meteorology as well, has furnished the climatologist with material of more than ordinary value. The data were compiled by Mr. Watts himself or under his immediate supervision. I have worked the records into the accompanying tables, 1–6, each of which is self-explanatory and, it is confidently believed, worthy of careful study.

Relative to the instruments used and their exposure, a few words ought to be said. Referring to Table 1, it should be noted that the record for 1889 and for January, February, and March of 1890, forms no part of Mr. Watts's record. These data are from a record kept at the Public Library, St. Johns. The barometer readings are those of an ordinary Fitzroy barometer and the temperatures are the readings of the attached thermometer and are, therefore, not true atmospheric temperatures. The barometer readings are uncorrected except for the three months in 1890 when a correction for elevation only was applied.

When Mr. Watts began the work on April 1, 1890, he exposed his instruments at the old laboratory, the barometer being 37 feet above sea level. A Fitzroy barometer was used until April 14, 1891, all readings being corrected for elevation but not for temperature. On April 15, 1891, a mercurial barometer with Fortin cistern was installed at the same elevation, and the readings were corrected for temperature and elevation but not for instrumental error. The corrections used were taken from an article on Barometers in Henry Watts's Dictionary of Chemistry, Vol. I, and were approved by the Meteorological Office, London.

The thermometers were all standard instruments and were exposed in a Stevenson's screen, the double bottom and top of which each contains an air space. The screen was placed about four feet above the ground, but it appears that the surroundings were not favorable for the best results and the temperatures were a little high. The wet thermometer was of the cup-and-wick pattern, and the dew-point was found according to the rule and the data given in Henry Watts's Dictionary of Chemistry, Vol. III, p. 227 (old edition).[1]

This arrangement obtained until November 30, 1895, when all the instruments were moved to the new laboratory. The cistern of the barometer was now 24 feet instead of 37 feet above the sea. The thermometer screen was now exposed some 20 feet above the ground on a south gallery, where doubtless radiation had an important effect upon the instruments within, thus still giving too high temperatures. This, I understand, is also Mr. Francis Watts's opinion on this point. On June 1, 1900, the screen was again moved, this time to the botanic station about one-fourth of a mile eastward of the town, and was placed in a level, open space, about 4 feet above a grass-covered lawn. The screen is now 70 or 80 feet above the sea and very favorably surrounded.

On December 23, 1893, a Robinson anemometer was set up at Skerretts, about 1 mile to the eastward of St. Johns. The cups have a diameter of 3 inches, and the arms from outside to outside of cups measure 15¼ inches. The anemometer is exposed 17 feet above the ground in a broad, open, and level space. The exposure of this instrument is, apparently, all that could be desired.

A 9-inch rain gage was used, being so placed that the rim was 4 feet above the ground. Unfortunately the gage was not only moved a number of times, but at no time was the exposure free from surrounding influences, and therefore not the best. The gage at the Public Library, so far as known, was never moved, but was also probably not free from local influences. On June 1, 1900, Mr. Watts had his gage moved to a good location outside of the town.

[1] That is to say, the observer used the revised Glaisher's factors. See Hygrometrical Tables, James Glaisher, London, 1869, p. iv.—ED.

Fortunately, however, we are not limited to this one record for our knowledge of the rainfall on the Island of Antigua. Table 5, for instance, gives the monthly and yearly means for a number of years, based upon quite a large number of stations well distributed over the island. At many of these stations the gages are not only well exposed, but have never been moved. In this connection, it may be interesting to compare the monthly means of Table 2 with those of Table 5, or, in other words, to compare the rainfall at St. Johns with that of the entire island. It will be noted that the fall at St. Johns for all months in the year, except September and November, is greater than that of the mean for the island and the mean annual fall at St. Johns exceeds the mean for the island by nearly 5 inches.

TABLE 1.—*Monthly mean pressure and temperature data for St. Johns, Antigua.*[2]

Date.	Air pressure.		Attached thermometer.	
	9 a. m.	3 p. m.	9 a. m.	3 p. m.
1889.	*Inches.*	*Inches.*	°*F.*	°*F.*
January	30.110	30.110	79.0	82.0
February	30.140	30.110	77.0	80.0
March	30.130	30.150	80.0	82.0
April	30.130	30.120	82.0	82.5
May	30.120	30.110	81.5	82.5
June	30.130	30.150	81.5	78.0
July	30.180	30.140	86.0	87.5
August	30.110	30.120	86.0	87.0
September	30.100	30.120	81.0	82.1
October	30.090	30.100	83.0	83.0
November	30.120	30.080	80.0	84.0
December	30.070	29.930	77.0	79.0
Annual means	30.115	30.103	81.2	82.5
1890.				
January	30.060	30.080	77.0	77.0
February	30.150	30.130	74.0	71.0
March	30.110	30.110	83.0	80.0

NOTE.—The observations were made on local time.—ED.

The data bearing upon the rainfall of Antigua are very complete and, to me, at least, very interesting. A careful study of the accompanying tables will reveal to the thoughtful many interesting points. Slight discrepancies in the means of the various tables may appear, but these were unavoidable, being the result of the various combinations and methods employed in obtaining the means, some of which were computed by Mr. Watts and some by myself. These differences, however, are immaterial in this connection. The means of Table 5 are, perhaps, slightly too great, for the reason that the period is not only short (twelve years), but contains the phenomenally wet year of 1889, when the mean for the island was about 60 per cent above the normal.

[2] The original Table 1 in Mr. Alexander's paper contained the monthly means and extremes of pressure, temperature, rainfall, wind, etc., arranged in chronological order from January, 1889, to December, 1900, inclusive, as copied from the record of Mr. Watts at St. John's, Antigua. As this arrangement was not conducive to the taking of monthly means and other climatological studies, the Editor has submitted this extensive table to Mr. H. H. Kimball for further elaboration, and all of Mr. Alexander's figures will be found rearranged in Mr. Kimball's article on the seasonal variations of the island of Antigua, except the data given in the preceding columns, which represent observations made by some unknown observer with the instruments kept at the Public Library in St. Johns, and the rainfall data, which Mr. Alexander had himself rearranged in his Tables 2 and 3.—ED.

Referring to Table 6, we find that of the twenty-six years there represented thirteen were below the normal and thirteen were above. The maximum deficiency, 17.22 inches, occurred in 1875, and the maximum excess, 27.59 inches, in 1889. Then, too, I can not refrain from inviting attention to the secular means in Table 5, which show a peculiar variation in the monthly averages beginning with May and concluding with December, while the departures in Table 6 reveal in a conspicuous manner the periods of large and small departures. They seem to indicate that for each period of seven or eight years, five or six years in succession will have a very nearly normal rainfall, followed by two years of comparatively large departures. For instance, the six years from 1876 to 1881 show very slight departures from the normal, but for the two following years, 1882 and 1883, the departures are very large, one above and one below the normal. Then comes another period of five years of nearly normal rainfall, followed again by two years of abnormally large departures, one above and one below the normal, and so on.

Taking 12,000 hogsheads of sugar as an average crop, and 46.00 inches of rain as the average fall, it would appear that for each inch of rain that falls the island produces 261 hogsheads of sugar.

TABLE 2.—*Monthly rainfall at St. Johns, Antigua, from April, 1866, to December, 1900, inclusive.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1866	.....	.....	.....	2.03	1.21	3.30	2.12	2.25	3.14	6.71	2.19	1.37	24.32
1867	2.15	3.56	0.63	6.11	11.02	10.36	4.74	2.95	7.52	3.20	6.46	5.22	63.92
1868	2.08	1.50	1.63	1.60	2.24	2.12	3.89	3.08	9.85	8.64	3.54	2.34	42.51
1869	2.33	2.63	2.00	0.88	1.86	5.70	2.04	3.77	6.83	2.80	5.22	2.21	38.27
1870	4.60	0.84	2.85	0.79	1.64	2.13	5.83	6.82	2.55	4.35	3.04	2.28	37.72
1871	3.47	1.49	3.05	4.20	3.30	1.81	2.93	2.52	4.01	3.40	1.97	2.82	34.97
1872	1.64	0.68	1.68	1.04	1.52	2.22	5.77	2.16	11.86	5.87	4.60	5.19	44.23
1873	4.05	1.17	4.22	1.11	1.83	1.39	1.75	4.63	5.84	6.62	1.92	2.52	37.05
1874	1.95	1.79	1.50	2.46	3.10	1.85	3.33	5.98	7.87	4.49	3.68	2.43	40.43
1875	2.50	2.83	3.52	1.24	1.48	2.99	3.06	4.71	3.16	6.11	1.08	7.49	40.17
1876	4.01	1.58	4.64	4.39	9.44	5.89	4.53	3.36	4.32	2.76	2.11	1.96	48.99
1877	2.08	4.06	0.44	8.45	2.64	6.58	3.69	2.94	3.99	6.90	6.35	4.16	51.58
1878	3.57	1.51	3.99	2.53	11.20	2.29	7.95	6.65	9.82	5.90	5.39	1.88	62.68
1879	3.63	5.75	1.81	5.47	11.39	6.90	5.96	12.15	2.78	8.66	7.71	4.22	76.43
1880	11.09	2.83	2.13	6.94	9.46	4.46	10.28	3.96	3.74	3.72	4.84	3.36	66.81
1881	2.77	2.71	0.66	4.13	8.01	10.65	5.23	8.70	4.79	12.65	6.25	1.30	66.85
1882	2.52	1.91	0.57	1.37	1.44	2.60	4.46	5.45	5.52	7.45	3.22	6.15	42.66
1883	3.75	4.18	2.27	4.64	6.76	5.08	3.63	6.19	3.13	10.70	10.12	8.69	69.14
1884	2.83	2.69	3.39	2.39	4.72	3.75	7.32	2.44	7.37	5.93	6.05	4.71	53.59
1885	2 50	1.59	1.47	2.25	1.57	2.04	3.31	9.85	2.63	9.87	9.28	4.70	51.15
1886	2.69	2.50	1.67	4.45	2.25	3.83	4.57	5.58	9.18	4.33	4.20	2.79	48.14
1887	3.16	2.76	1.32	0.54	3.84	7.90	4.43	6.11	7.32	6.31	4.55	1.65	49.89
1888	3.01	2.14	2.02	4.15	1.84	5.57	7.19	7.46	4.72	6.09	4.31	1.62	50.12
1889	2.83	5.36	4.03	8.27	12.29	17.51	4.18	7.08	13.71	6.01	4.56	3.23	89.06
1890	5.21	1.00	2.51	9.72*	3.06	1.30	3.79	5.53	5.26	3.32	1.56	1.96	44.22
1891	5.38	2.03	0.57	4.85	2.29	4.47	7.78	5.73	5.31	7.98	7.90	3.11	57.40
1892	5.64	0.91	1.02	1.59	1.99	3.77	3.87	2.58	4.68	5.22	10.03	1.99	43.29
1893	2.78	1.98	3.28	2.61	1.85	2.68	4.12	2.82	4.89	7.98	1.63	3.84	40.49
1894	2.89	1.69	1.18	6.36	3.60	1.30	2.60	1.09	7.41	5.13	8.05	6.70	48.00
1895	2.92	0.73	1.60	2.98	10.47	2.58	5.08	7.48	7.67	5.57	5.25	10.90	63.23
1896	3.84	2.71	2.55	2.21	6.20	7.22	6.61	4.85	3.18	4.95	15.54	5.21	64.57
1897	3.02	3.24	6.24	1.87	6.88	2.68	7.19	2.42	4.56	2.85	2.82	4.10	47.87
1898	2.94	1.22	2.78	0.93	3.17	2.99	9.64	6.45	14.85	4.80	9.72	3.69	63.18
1899	3.97	1.83	1.11	0.84	1.08	3.30	8.40	9.23†	10.48†	2.63	7.72	2.64	53.23
1900	1.72	1.84	1.18	2.13	3.89	2.33	4.91	6.48	2.27	10.28	3.10	3.26	43.39
Means 34 y'rs‡	3.39	2.27	2 22	3.40	4.69	4.42	5.12	5.25	6.27	5.98	5.38	3.83	52.21

* Beginning with April, 1890, the record was kept at the Government Laboratory; before this date at the Public Library.

† Partly estimated, gage blown over.

‡ The means are for the 34 years from 1867 to 1900, inclusive.

TABLE 3.—*Days on which one inch or more of rain fell at St. Johns, Antigua, during the eleven years from* 1890 *to* 1900, *inclusive.*

Year.	January.		February		March		April.		May.		June.		July.		August.		September.		October.		November		December.	
	Am't.	Date.	Am't.	Date.	Am't	Date.	Am't.	Date.	Am't.	Date	Am't.	Date.	Am't.	Date.	Am't.	Date	Am't.	Date.	Am't.	Date.	Am't.	Date.	Am't.	Date.
1890							6.06	16							1.26	13	1.05	15						
1890																	1.50	25						
1891							2.10	20			1.03	7	1.60	14	1.70	25	1.32	3	1.07	7	1.06	15		
1891							1.75	22			1.15	21	1.48	19			1.50	7	1.95	14	2.10	21		
1891													1.17	30					1.34	15				
1891																			1.12	18				
1892	3.33	5									1.41	20					1.60	6	1.50	23	1.22	5		
1892																					1.31	6		
1892																					1.28	10		
1893															1.50	15	1.43	23	1.50	15				
1893																			2.20	18				
1894							4.23	19									1.26	4	1.13	13	1.90	24	1.44	12
1894																	1.02	29			1.71	26	2.87	18
1895							2.15	21	3.71	23			1.55	23	2.81	22	1.61	1	1.21	19	1.10	16	3.95	1
1895									3.49	28					1.50	31	1.05	20			1.17	27	1.90	10
1895																							2.28	12
1896	1.16	7							1.20	1	1.20	1	1.07	12	1.00	8			1.60	5	1.12	8	2.58	13
1896									1.10	2	1.02	4	1.01	13					1.00	30	1.47	16		
1896									1.00	3											2.03	27		
1896																					4.78	28		
1896																					2.00	29		
1897	1.50	5	1.68	5	2.36	9			3.19	17			1.24	25			1.09	24						
1897													1.20	28										
1898					1.20	10			1.66	5	1.08	3	2.10	6	1.08	12	1.66	4	1.82	27	1.75	5	1.08	20
1898													1.30	9	1.75	16	2.50	11			5.98	6		
1898													1.18	25			5.25	12						
1898																	3.30	20						
1899													3.30	14	5.00*	7	6.00*	8			1.22	21		
1899													1.50*	27	1.52	28	1.23	28			2.98	23		
1899															1.53	30								
1900					1.00	12			2.03	18					1.04	27			1.53	23				
1900															2.50	30			5.09	25				

* Estimated, gage blown over.

TABLE 4.—*Summary of meteorological records at St. Johns, Antiqua, for the ten years* 1891–1900.

Years.	Mean air pressure.		Mean temperature. Dry.		Mean temperature. Wet		Mean dew-point.		Wind. Prevailing direction.		Wind. Average daily movement.	Precipitation. Total amount.	Precipitation. Number days with .01 inch or more.	Number of— Thunderstorms.	Number of— Earthquakes.
	9 a. m.	3 p. m.	9 a. m.	3 p. m.	9 a. m.	3 p. m.	9 a. m.	3 p. m.	9 a. m.	3 p. m.					
	Inches.	*Inches.*	°	°	°		°	°			*Miles.*	*Inches.*			
1891	30.075	30.023	80.9	82.9	74.4	74.7	70.0	70.0	e.	e.	....	57.40	267	21	9
1892	30.097	30.035	81.4	83.2	73.8	74.3	69.0	69.0	e.	e.	....	43.29	261	11	5
1893	30.046	29.979	81.0	83.1	74.3	74.9	70.0	69.0	e.	e.	....	40.49	256	22	3
1894	30.077	30.007	80.8	83.1	73.9	74.7	70.0	69.0	e.	e	209.8	48.00	247	13	10
1895	30.070	30.004	80.1	83.4	74.7	75.6	70.0	70.0	e.	e.	207.0	63.23	252	19	8
1896	30.089	30.019	81.4	84.2	74.6	75.5	70.0	70.0	e.	ene.	196.4	64.57	239	17	5
1897	30.100	30.031	81.8	84.5	74.9	75.7	70.0	70.0	e.	e.	180.6	47.87	236	11	8
1898	30.063	29.998	81.8	84.4	74.3	75.0	69.0	69.0	e.	e.	186.4	63.18	229	14	7
1899	30.065	29.994	81.6	84.6	74.3	75.2	70.0	69.0	e.	e.	185.6	53.23	221	17	8
1900	30.065	30.002	82.2	84.3	74.6	74.9	70.0	70.0	e.	e.	170.3	43.39	194	8	11
Secular means	30.075	30.009	81.3	83.8	74.4	75.0	69.8	69.5	e.	e.	190.9	52.46	240.2	15.3	7.4

NOTE.—The observations were made on local time.—ED.

TABLE 5.—*Monthly and annual average rainfall* (*in inches and hundredths*) *on the island of Antigua for a period of twelve years*, 1888 *to* 1899, *inclusive.*

Year.	Number of stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1888	47	2.09	1.83	1.44	3.54	2.44	3.48	6.06	7.24	5.30	5.40	3.83	1.52	44.02
1889	51	1.70	5.07	4.05	6.96	9.86	14.36	3.10	5.27	11.15	5.17	3.33	3.69	73.51
1890	46	3.60	1.18	1.84	7.53	2.31	1.04	2.52	3.72	5.23	2.82	1.33	2.57	35.79
1891	45	3.67	2.24	0.34	2.71	1.87	4.02	9.95	5.63	3.63	7.01	6.70	1.86	50.01
1892	53	5.77	0.82	0.86	1.18	2.35	3.27	3.15	2.16	4.33	4.35	8.99	1.81	38.53
1893	54	1.78	1.50	2.66	2.10	2.04	2.09	4.60	2.99	6.53	8.42	1.16	2.83	38.69
1894	68	1.89	1.03	1.29	2.76	2.75	1.31	1.57	1.38	5.31	5.66	5.26	8.58	38.87
1895	69	2.30	0.51	1.45	2.30	7.94	1.57	3.65	6.46	7.41	5.13	5.08	8.83	52.91
1896	56	3.10	1.71	2.08	1.54	6.33	7.33	5.89	4.88	2.88	7.11	13.66	3.55	59.85
1897	54	2.28	2.24	6.18	1.15	5.91	2.25	6.01	1.70	3.73	1.86	2.68	3.69	39.67
1898	66	2.08	1.19	2.39	0.95	2.00	1.95	6.69	5.09	12.30	3.29	8.29	2.68	48.85
1899	63	3.17	1.20	0.86	0.46	1.17	2.67	7.50	7.14	10.54	4.98	5.60	1.54	47.50
Secular means	....	2.79	1.71	2.12	2.76	3.91	3.78	5.06	4.47	6.53	5.10	5.49	3.55	47.35

The average rainfall for twenty-six years, from 1874 to 1899, inclusive, was 46.00 inches.

TABLE 6.—*Average annual rainfall on the island of Antigua for a period of twenty-six years*, 1874 *to* 1899, *inclusive.*

Year.	Number of stations.	Rainfall.	Departure from the normal.
		Inches.	*Inches.*
1874	41	31.16	−14.84
1875	40	28.78	−17.22
1876	36	41.98	− 4.02
1877	38	49.05	+ 3.05
1878	53	47.11	+ 1.11
1879	52	61.54	+15.54
1880	46	49.69	+ 3.69
1881	44	53.75	+ 7.75
1882	45	33.04	−12.96
1883	56	55.51	+ 9.51
1884	56	43.98	− 2.02
1885	53	43.39	− 2.61
1886	55	47.78	+ 1.78
1887	50	43.68	− 2.32
1888	47	44.23	− 1.77
1889	50	73.59	+27.59
1890	45	33.00	−13.00
1891	45	50.01	+ 4.01
1892	53	38.53	− 7.47
1893	54	38.69	− 7.31
1894	68	38.87	− 7.13
1895	69	52.91	+ 6.91
1896	56	59.85	+13.85
1897	54	39.67	− 6.33
1898	66	48.85	+ 2.85
1899	63	47.50	+ 1.50

THE SEASONAL VARIATIONS IN THE CLIMATE OF ANTIGUA, W. I.

By H. H. Kimball, Weather Bureau.

The very interesting meteorological data for St. Johns, Antigua, W. I., embracing the observations of Mr. Francis Watts, chemist and government analyst for the Leeward Islands, and communicated by Mr. W. H. Alexander in Table 1 of his article entitled "Climatology of Antigua, W. I[1]." have been rearranged in the following 21 smaller tables so as to show in addition to the annual means, which in most cases were worked out by Mr. Alexander, the monthly and annual averages which have been computed by myself. In the case of a tropical oceanic climate like that of Antigua, where the variations from year to year, unlike those of the higher latitudes, are extremely small, excepting perhaps the variations in the rainfall, the changes from month to month, or from season to season, are of the greater interest.

For a description of instruments and exposures see Mr. Alexander's article above referred to. Apparently the correction to be applied to the readings of the barometer to reduce them to the readings of a standard instrument is unknown, but a comparison of the mean readings for 1899 and 1900 with those for Basseterre, St. Kitts, for the same years, after reducing the St. Johns readings to standard gravity, indicates that this correction is within the probable error[2] of the data for Basseterre, and is quite likely to be between ± 0.00 and $+0.01$ inch.

The observations appear to have been taken at 9 a. m. and 3 p. m., local time, corresponding to 8:07 a. m. and 2:07 p. m. seventy-fifth meridian time, or just previous to the principal maximum and minimum in the diurnal pressure curve. The mean of these two observations is only .002 or .003 higher than the mean of the hourly readings[3]. The barometric data were given by Mr. Alexander to thousandths of inches, and the means were computed from the data as so given, but only inches and hundredths have been retained in the printed tables.

The monthly averages of pressure show a maximum in February and again in June and July, with a decided minimum in October and November; the summer maximum is much more pronounced than at other West Indian stations. The winter maximum is easily explained by the southward movement at this season of the belt of high pressure encircling the globe north of the equator; the summer maximum may be attributed to the building up of the area of high pressure over the Atlantic which reaches a maximum in July.[4] The principal minimum of the year occurs a month later than in Havana, and is attributable to the combined effect of the northward movement of the high pressure belt, and the contraction of the Atlantic high pressure area.

It is interesting to notice that the average daily wind movement follows much the same law as the average monthly pressure, showing a decided maximum in June and July and a decided minimum in October. The wind direction data is not of a character that enables us to study changes of direction from season to season, since the prevailing direction only is given, that is, the direction observed the greatest number of times during the month, and this is almost always from the east. We notice, however, that northeasterly winds prevail less frequently in summer than in winter, and therefore infer that the prevailing easterlies, in a latitude where we would naturally expect northeasterlies, are due to the anticyclonic circulation about the Atlantic high to the east of Antigua. While the full observations of wind direction for Antigua would no doubt show the same strong northeasterly component that is observed at other West Indian stations, it must be admitted that the influence of the Atlantic high pressure area on both the atmospheric pressure and the winds of Antigua is very marked.

The table of lowest temperatures shows very clearly the effect upon the minimum thermometer of the change in the exposure of the instruments in November, 1895, referred to by Mr. Alexander, and the annual mean of the minimum temperatures after this date averages nearly 3° higher than before. The annual mean of the maximum temperatures is slightly lower after the removal than before, so that on the whole we may say that since November, 1895, the temperatures recorded have averaged too high, and the diurnal range of temperature has been too small.

The monthly averages of temperature vary less than 3° from the annual average. February is the coldest month and August the warmest, but the highest temperatures do not occur until September and October. Similarly, the minimum monthly rainfall for the whole island occurs in February, and the maximum in September.

The convectional origin of much of the rainfall is apparent, since besides the coincidence in the time of the occurrence of the maximums of temperature and rainfall already noted, there is also a marked decrease in the wind movement during September as compared with the summer months; moreover thunderstorms, which are unknown in February, average 2.5 per month during the summer, 2.6 in September, and reach a maximum of 3.2 per month in October. In this connection, however, Mr. Alexander has referred to an interesting relation between the rainfall at St. Johns and the average rainfall for the whole island, as shown by his tables 2 and 5. In general, the rainfall at St. Johns, on the leeward side of the island, is greater than the average for the whole island, the only exceptions to this rule occurring in September and November, or at a season of the year when, as we have seen, the winds are comparatively light and the convectional action comparatively strong. It therefore appears that in the case of Antigua either the crest of the atmospheric wave,[5] caused by the air being blown against the sides of the mountains on the island, occurs at some little distance after the tops of the mountains are passed, or else the forward drift of the clouds formed on the upward slope of this wave is very appreciable. Under the average conditions of pressure, temperature, and humidity that prevail during the summer at 3 p. m., the air at sea level would have to rise to a height of about 2,600 feet, or 400 feet above the tops of the highest mountains on the island, before it would be cooled adiabatically to the saturation point. It is, therefore, not impossible that in this case the heaviest rain may occur on the leeward side of the island, but it is very much to be desired that the rainfall data may be rearranged so as to leave no doubt as to this point. As is well known, but little rain falls in the trade wind belts except where the winds are deflected upward by mountains.

Mr. Alexander has referred to the dryness of the climate of Antigua, and I have, therefore, computed the relative humidity from the monthly means of the dry and wet bulb thermometer readings, using Marvin's Psychrometric Tables (W. B. No. 235, 1900), which are based on readings of the whirled psychrometer, and therefore would not apply to the readings of a stationary hygrometer unless the wind was sufficient to thoroughly ventilate the shelter at all times. While this seems to have generally been the case at Antigua, we suspect the relative humidities here given are a little too high, although the average of the two observations, 69.5, is considerably less than the average given by Prof. M. W. Davis for the mean relative humidity of the trade winds over the oceans, namely, 77 per cent.[6] Ravenstein's charts, British Associa-

[1] See page 165.

[2] See page 24, Report of the Chief of the Weather Bureau, 1899-1900.

[3] See hourly readings for Basseterre, Report of the Chief of Weather Bureau, 1899-1900, pp. 314-315.

[4] See Bartholomew's atlas of meteorology, London, 1899, plate 12.

[5] See the memoir by Dr. F. Pockels, p. 152 of this Review.

[6] Elementary Meteorology, Davis, Boston, 1894, p. 152.

tion for the Advancement of Sciences, 1870, p. 812, would seem to make the humidity less than 80 per cent.

The mean dew-point computed by the use of Glaisher's factors gives an average annual vapor tension of 0.732, and an average relative humidity of 68.4 at 9 a. m., and 63.7 at 3 p. m., which is considerably less than the humidity given by the psychrometric formula. It may therefore be that Glaisher's factors are the more accurate for determining dew-points and humidities from readings of a stationary hygrometer, under conditions such as prevail at Antigua.

These tables emphasize the importance of proper exposure of instruments, if records of value in the study of the climatology of a place are to be obtained. The increase of nearly 3° in the annual mean minimum thermometer reading, due to a change of exposure in November, 1895, is as great as the differences in the average annual mean minimum temperatures for the different islands of the Windward group. Any error in recording the temperature also enters into the relative humidity data, and a comparison between the climates of the different islands is thus made difficult.

Meteorological data for St. Johns, Antigua, W. I.

TABLE 1.—BAROMETRIC PRESSURE, 9 A. M.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
1890	....	....	....	30.16	30.17	30.20	30.08	29.99	30.03	30.02	30.00	30.06	....
1891	30.10	30.14	30.07	30.08	30.06	30.09	30.11	30.09	30.04	30.00	30.03	30.08	30.08
1892	30.11	30.10	30.12	30.13	30.12	30.16	30.15	30.01	30.09	30.05	30.02	30.10	30.10
1893	30.07	30.11	30.10	30.09	30.05	30.08	30.04	30.01	30.00	29.94	30.02	30.05	30.05
1894	30.10	30.16	30.12	30.08	30.02	30.11	30.12	30.07	30.04	30.03	30.04	30.04	30.08
1895	30.10	30.10	30.11	30.10	30.09	30.13	30.12	30.03	30.02	29.99	30.03	30.03[a]	30.07
1896	30.10	30.14	30.10	30.08	30.06	30.12	30.14	30.10	30.03	30.04	30.03	30.11	30.09
1897	30.11	30.17[b]	30.11	30.11	30.07	30.14[a]	30.12	30.10	30.09	30.06	30.04	30.08	30.10
1898	30.13	30.09	30.05	30.10[a]	30.06	30.08	30.07	30.05	30.00	30.02	30.00	30.10	30.06
1899	30.13	30.15	30.12	30.08	30.10	30.09	30.06	30.02	30.03	29.98	30.00	30.02	30.06
1900	30.08	30.13	30.11	30.07	30.07	30.06[f]	30.06	30.06	30.04	30.02	30.00	30.09	30.06
Means	30.10	30.13	30.10	30.09	30.07	30.11	30.10	30.05	30.04	30.01	30.02	30.07	30.08

TABLE 2.—BAROMETRIC PRESSURE, 3 P. M.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	....	....	....	30.13[e]	30.15[e]	30.18[d]	30.06[d]	30.00[e]	29.97[d]	29.95[d]	29.94[e]	29.99[f]	....
1891	30.04[e]	30.08[d]	30.03[g]	30.04[d]	30.04[e]	30.05[e]	30.07[d]	30.05[f]	30.00[d]	29.93[d]	29.93[e]	30.02[f]	30.02
1892	30.02[g]	30.02[d]	30.03[d]	30.06[f]	30.06[f]	30.11[e]	30.12[e]	30.03[d]	30.02[d]	29.97[e]	29.95[e]	30.02[e]	30.04
1893	30.00[f]	30.02[d]	30.02[e]	30.01[f]	30.00[e]	30.03[e]	30.00[e]	29.93[e]	29.96[d]	29.86[e]	29.94[e]	29.98[g]	29.98
1894	30.02[f]	30.08[d]	30.05[f]	30.01[e]	29.97[f]	30.07[d]	30.08[e]	30.02[f]	29.96[e]	29.92[d]	29.96[e]	29.95[g]	30.01
1895	30.02[e]	30.02[d]	30.04[e]	30.02[e]	30.03[e]	30.09[f]	30.08[d]	29.98[e]	29.96[e]	29.92[e]	29.94[e]	29.94[g]	30.00
1896	30.02[e]	30.06[d]	29.98[e]	30.01[f]	30.01[g]	30.08[d]	30.11[d]	30.05[f]	29.97[d]	29.95[d]	29.95[f]	30.02[f]	30.02
1897	30.04[f]	30.10[d]	30.03[d]	30.04[f]	30.01[f]	30.09[g]	30.07[d]	30.04[f]	30.03[d]	29.98[e]	29.96[e]	30.00[f]	30.03
1898	30.05[f]	30.01[d]	29.99[d]	30.03[f]	30.00[g]	30.04[e]	30.03[f]	30.00[e]	29.94[e]	29.95[e]	29.93[e]	30.02[e]	30.00
1899	30.05[f]	30.08[d]	30.04[e]	30.01[f]	30.03[f]	30.04[d]	30.02[e]	29.96[d]	29.96[d]	29.91[e]	29.88[e]	29.94[g]	29.99
1900	30.00[e]	30.05[d]	30.04[d]	29.99[g]	30.01[e]	30.04[l]	30.03[e]	30.01[e]	29.99[e]	29.94[d]	29.92[e]	30.01[f]	30.00
Means	30.03	30.06	30.02	30.02	30.02	30.06	30.06	30.01	29.98	29.93	29.94	29.99	30.01
Means of the 9 a. m. and 3 p. m. pressure.	30.06	30.09	30.06	30.06	30.04	30.08	30.08	30.04	30.01	29.97	29.98	30.03	30.04

NOTE.—Data for 1890 not included in the means. The instrumental error of the barometer is unknown. The readings have been reduced to sea level, but not to standard gravity.

TABLE 3.—DRY THERMOMETER, 9 A. M.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1890	....	....	....	79.0	83.0	82.0	83.0	82.0	82.0	83.0	82.0	80.0	80.9
1891	77.5	77.0	79.0	81.0	83.0	83.0	82.0	83.0	84.0	84.0	79.0	78.0	80.9
1892	78.0	77.0	83.5	80.5	81.0	83.0	83.0	84.0	83.8	83.8	80.5	79.0	81.4
1893	77.8	78.0	78.0	79.8	82.3	82.5	82.7	84.0	83.0	82.5	82.3	78.9	81.0
1894	77.7	76.8	77.4	79.8	82.1	83.4	83.4	84.1	83.9	81.4	80.8	78.4	80.8
1895	76.7	77.0	79.0	81.2	80.7	82.7	82.8	83.3	83.1	82.8	81.3	80.8	80.1
1896	78.8	78.1	79.0	79.8	81.7	83.3	83.3	83.5	84.6	83.9	80.5	80.4	81.4
1897	78.8	78.5[b]	78.7	80.8	82.3	82.6[a]	83.3	84.2	84.3	84.4	82.8	81.3	81.8
1898	79.3	78.7	79.2	80.8[a]	83.0	84.4	83.3	84.0	83.5	83.6	81.0	80.5	81.8
1899	78.6	78.1	78.3	80.8	82.8	83.4	83.4	84.0	83.5	83.6	82.8	80.3	81.6
1900	79.8	78.3	79.2	81.4	83.0	83.6	83.4	86.3	84.7	83.7	82.5	80.2	82.2
Means	78.3	77.8	79.1	80.4	82.3	83.1	83.1	83.9	83.7	83.3	81.4	79.8	81.3

TABLE 4.—DRY THERMOMETER, 3 P. M.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	....	....	....	80.0[e]	81.0[e]	84.0[e]	82.8[d]	84.0[e]	84.0[d]	83.5[d]	82.5[e]	82.0[f]	82.4
1891	80.0[e]	79.0[d]	82.0[g]	83.0[d]	84.0[e]	84.0[e]	84.0[d]	85.0[f]	85.0[d]	84.0[d]	82.0[e]	82.0[f]	82.9
1892	80.8[g]	81.0[d]	82.8[d]	82.0[f]	82.0[f]	84.5[e]	85.5[e]	86.0[d]	85.0[d]	85.0[e]	82.5[e]	81.0[e]	83.2
1893	80.7[f]	80.8[d]	81.5[e]	81.5[f]	83.6[e]	85.0[e]	85.0[e]	86.8[e]	85.3[d]	83.7[e]	83.7[e]	80.0[g]	83.1
1894	79.7[f]	80.2[d]	80.6[f]	81.5[e]	83.6[f]	85.4[d]	85.8[e]	86.9[f]	85.9[e]	83.6[d]	82.4[e]	81.7[g]	83.1
1895	81.3[e]	82.0[d]	82.6[e]	83.8[e]	83.0[e]	84.8[f]	85.2[d]	85.2[e]	84.8[e]	82.8[e]	82.3[e]	83.7[g]	83.4
1896	82.0[e]	81.7[d]	82.5[e]	82.7[f]	84.2[g]	84.6[d]	85.2[d]	86.2[f]	88.0[d]	86.2[d]	83.4[f]	83.8[f]	84.2
1897	82.8[f]	82.5[d]	82.2[d]	84.0[f]	83.6[f]	84.3[g]	85.4[d]	86.9[f]	86.7[d]	86.7[e]	84.9[e]	83.6[f]	84.5
1898	83.6[f]	82.8[d]	82.5[d]	83.5[f]	84.9[g]	86.4[e]	84.5[f]	85.8[e]	85.2[e]	85.7[e]	83.8[e]	83.9[e]	84.4
1899	82.4[f]	82.0[d]	81.9[e]	83.5[f]	85.2[f]	85.5[d]	86.1[e]	85.1[d]	85.8[d]	86.8[e]	85.9[e]	85.1[g]	84.6
1900	84.3[e]	82.6[d]	82.3[d]	83.2[g]	85.0[e]	84.1[d]	87.6[e]	85.2[e]	85.3[e]	84.2[d]	83.3[e]	81.3[f]	84.3
Means	81.8	81.5	82.1	82.6	83.6	84.8	85.2	85.7	85.5	84.7	83.3	82.6	83.6

TABLE 5.—MEAN MAXIMUM TEMPERATURE

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1890	....	....	....	84.0	85.0	87.0	87.0	87.0	88.0	87.5	86.0	85.5	85.7
1891	82.5	82.5	84.0	86.0	87.0	87.5	87.0	87.8	89.0	88.5	86.5	84.0	86.0
1892	84.0	84.8	86.5	86.0	85.5	87.0	88.0	89.0	88.8	88.8	85.0	84.5	86.5
1893	83.3	83.0	84.0	85.0	86.5	87.6	88.6	89.8	88.6	87.7	87.0	83.3	86.2
1894	82.5	82.9	83.4	85.0	87.0	87.9	88.6	90.2	88.9	86.5	85.2	84.2	86.0
1895	83.6	84.5	85.8	86.9	85.9	87.5	88.2	88.9	88.0	86.7	85.6	85.9*	86.4
1896	....	82.7	83.3	83.7	84.6	86.0	86.0	87.3	88.8	88.1	85.0	84.8	85.3
1897	84.6	83.5	82.9	85.0	85.2	85.5	86.4	87.7	87.7	88.2	86.8	85.6	85.8
1898	84.7	83.9	83.6	84.4	85.7	87.0	86.2	87.0	86.9	87.4	85.4	85.1	85.6
1899	83.4	82.6	82.5	84.3	86.2	86.5	86.9	87.0	87.6	87.8	87.1	86.7	85.7
1900	85.1	83.9	83.6	85.2	86.1	86.6	86.7	87.4	88.0	87.1	85.1	84.9	85.8
Means	83.7	83.4	84.0	85.0	85.9	86.9	87.2	88.1	88.2	87.7	85.9	85.0	85.9

* Mean for the first seventeen days of the month.

TABLE 6.—MEAN MINIMUM TEMPERATURE.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	....	....	....	68.0	71.0	73.0	73.0	74.0	72.0	72.0	73.0	70.0	71.4
1891	68.5	69.5	67.0	72.0	73.0	74.5	75.0	74.5	73.5	73.0	72.0	69.2	71.8
1892	68.5	67.0	69.5	71.0	74.0	74.5	74.8	74.8	73.0	73.0	71.0	70.0	71.8
1893	67.7	68.7	71.0	70.0	72.7	74.0	74.0	74.7	72.8	72.4	70.6	70.3	71.6
1894	68.2	68.0	67.4	70.6	71.8	74.5	74.3	75.7	73.8	72.8	72.2	69.6	71.6
1895	68.4	69.5	70.3	71.8	72.7	74.3	74.7	75.6	74.7	73.5	73.0	72.2	72.5
1896	70.8	71.8	72.2	73.8	72.2	76.8	77.1	77.5	77.2	76.0	74.1	74.1	74.5
1897	72.0	71.7	71.5	73.7	75.6	76.4	77.0	78.1	77.1	76.8	75.2	73.8	74.9
1898	72.3	71.2	71.5	73.5	76.0	77.3	76.2	77.1	76.7	76.2	73.3	73.2	74.5
1899	72.2	71.7	71.4	73.3	75.3	76.5	77.5	77.8	76.8	76.1	75.7	71.9	74.7
1900	73.0	72.0	73.2	74.0	76.0	75.0	75.4	75.6	75.5	74.3	72.6	72.2	74.1
Means	70.2	70.1	70.5	72.0	73.7	75.2	75.4	75.9	74.8	74.2	73.0	71.5	73.0

TABLE 7.—MEAN TEMPERATURE (MAX. + MIN.) ÷ 2.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	....	....	....	76.0	78.0	80.0	80.0	80.5	80.0	79.8	79.5	77.8	78.6
1891	75.5	76.0	75.5	79.0	80.0	81.0	81.0	81.2	81.2	80.8	79.2	76.6	78.9
1892	76.2	75.9	78.0	78.5	79.8	80.8	81.4	81.9	80.9	80.9	78.0	77.2	79.1
1893	75.5	75.8	77.5	77.5	79.6	80.8	81.3	82.2	80.7	80.0	78.8	76.8	78.9
1894	75.4	75.4	75.4	77.8	79.4	81.2	81.4	83.0	81.4	79.6	78.7	76.9	78.8
1895	76.0	77.0	78.0	79.4	79.3	80.9	81.4	82.2	81.4	80.1	79.3	79.0	79.5
1896	....	77.2	77.8	78.8	78.4	81.4	81.6	82.4	83.0	82.0	79.6	79.4	79.9
1897	78.3	77.6	77.2	79.4	80.4	81.0	81.7	82.9	82.4	82.5	81.0	79.7	80.3
1898	78.5	77.6	77.6	78.0	80.8	82.2	81.2	82.0	81.8	81.8	79.4	79.2	80.0
1899	77.8	77.2	77.0	78.8	80.8	81.5	82.2	82.4	82.2	82.0	81.4	79.3	80.2
1900	79.0	78.0	78.4	79.6	81.0	80.8	81.0	81.5	81.8	80.7	78.9	78.6	79.9
Means	76.9	76.8	77.2	78.4	79.8	81.1	81.3	82.0	81.5	80.9	79.4	78.2	79.5

TABLE 8.—HIGHEST TEMPERATURE.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	....	....	....	88	90	91	90	90	90	90	88	88	91
1891	85	84	89	89	90	90	90	91	92	93	92	86	93
1892	86	89	90	89	89	89	90	91	91	92	88	88	92
1893	86	85	87	88	89	90	91	92	92	92	90	86	92
1894	85	84	85	88	90	90	90	92	93	89	87	87	93
1895	86	87	88	92	89	90	92	92	90	89	89	90[a]	92
1896	....	85	86	86	87	88	88	89	92	92	89	87	92
1897	88	86	86	87	88	88	88	90	90	91	89	90	91
1898	88	86	86	86[a]	89	89	88	88	90	90	89	87	90
1899	86	86	85	86	87	88	89	90	90	92	90	90	92
1900	88	86	86	88	88	89	89	90	91	91	90	89	91
Absolute maximum	88	89	90	92	90	91	92	92	93	93	92	90	93

TABLE 9.—LOWEST TEMPERATURE.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	....	....	....	62	68	69	69	72	70	67	65	63	....
1891	61	67	60	68	66	72	72	71	70[a]	69	65	63	60
1892	61	61	63	60	72	71	71	70	71	68	68	66	60
1893	63	60	61	62	68	72	72	71	70	67	65	65	60
1894	61	67	60	67	67	72	71	73	69	70	68	63	60
1895	61	63	68	68	70	71	71	72	72	69	67	67	61
1896	65	69	67	72	73	73	74	75	75	71	69	71	65
1897	68	66[b]	67	71	72	74	73	74	72	75	71	70	66
1898	68	67	68	71[a]	73	75	72	74	73	72	68	69	67
1899	70	70	69	70	72	74	73	72	73	73	73	65	65
1900	69	70	71	72	75	72	72	73	73	71	70	70	69
Absolute minimum	61	60	60	60	66	69	69	70	69	67	65	63	60

TABLE 10.—WET THERMOMETER, 9 A. M.

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1890	....	....	....	72.5	74.2	75.1	76.0	76.6	77.2	76.7	75.0	73.3	74.1
1891	71.0	69.0	70.5	73.8	74.0	76.0	76.8	77.0	77.8	77.5	76.0	72.8	74.4
1892	72.5	70.0	71.8	71.0	74.5	75.5	72.5	77.0	76.0	76.5	75.5	72.5	73.8
1893	71.5	71.0	70.5	72.4	74.7	76.6	77.0	77.3	77.4	77.0	74.7	72.0	74.3
1894	70.8	69.6	70.5	73.1	75.7	75.7	75.6	76.0	76.8	75.8	74.8	72.6	73.9
1895	70.7	70.1	71.2	73.5	74.5	77.2	77.3	77.2	77.7	77.0	75.2	74.8	74.7
1896	72.3	71.3	71.4	71.9	74.8	76.6	76.8	77.2	77.6	77.0	74.1	74.4	74.6
1897	72.6	71.5[b]	72.3	73.5	75.5	75.5[a]	76.5	76.9	77.1	76.8	75.9	75.0	74.9
1898	72.2	70.3	70.0	71.8[a]	75.1	75.9	76.6	77.2	77.2	76.6	74.3	73.9	74.3
1899	71.3	70.7	70.2	72.0	74.5	75.7	76.5	77.2	77.3	77.0	76.8	72.5	74.3
1900	72.5	71.2	70.7	73.6	75.3	76.2	76.4	76.7	77.1	76.7	75.1	74.2	74.6
Means	71.7	70.5	70.9	72.6	74.8	76.0	76.2	76.9	77.2	76.8	75.2	73.5	74.4

TABLE 11.—WET THERMOMETER, 3 P. M.

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	....	....	....	73.5[f]	74.7[e]	75.8[e]	76.7[d]	77.6[e]	77.0[d]	76.5[d]	75.0[e]	73.5[f]	74.7
1891	72.0[e]	69.5[d]	71.5[g]	74.5[d]	75.5[e]	76.0[e]	77.0[d]	78.0[f]	78.5[d]	74.0[d]	76.0[e]	74.0[f]	74.7
1892	73.0[g]	71.2[d]	72.8[d]	72.0[f]	75.0[f]	72.0[e]	77.0[e]	76.8[d]	76.0[d]	77.0[e]	76.0[e]	73.0[e]	74.3
1893	72.4[f]	71.8[d]	71.4[e]	73.0[f]	75.0[e]	77.3[e]	77.7[e]	78.2[e]	77.7[d]	76.7[e]	75.0[e]	72.5[g]	74.9
1894	71.6[f]	70.6[d]	71.4[f]	74.0[e]	76.4[f]	76.5[d]	76.3[e]	76.8[f]	77.3[e]	75.8[d]	75.4[e]	73.8[g]	74.7
1895	72.7[e]	72.0[d]	72.4[e]	74.3[e]	75.1[e]	78.2[f]	77.7[d]	77.9[e]	78.3[e]	77.2[e]	75.9[e]	75.4[g]	75.6
1896	73.9[e]	72.4[d]	72.7[e]	72.7[f]	75.5[g]	76.6[d]	77.4[d]	77.9[f]	78.5[d]	77.7[d]	75.2[f]	75.9[f]	75.5
1897	73.9[f]	72.4[d]	73.3[d]	74.2[f]	75.7[f]	76.1[g]	77.3[d]	77.9[f]	77.6[d]	77.5[e]	76.5[e]	75.8[f]	75.7
1898	73.2[f]	71.3[d]	71.4[d]	72.9[f]	75.5[g]	76.6[e]	76.9[f]	77.7[e]	77.3[e]	77.5[e]	75.3[e]	75.0[e]	75.0
1899	72.6[f]	71.6[d]	71.4[e]	72.8[f]	74.8[f]	76.1[d]	77.6[e]	77.8[d]	77.8[d]	78.2[e]	77.6[e]	74.3[g]	75.2
1900	70.9[e]	72.6[d]	72.1[d]	74.2[g]	76.0[e]	75.8[d]	76.7[e]	77.2[e]	77.4[e]	75.7[d]	75.8[e]	75.0[f]	74.9
Means	72.6	71.5	72.0	73.5	75.4	76.1	77.1	77.6	77.6	76.7	75.8	74.4	75.0

TABLE 12.—DEW-POINT, 9 A. M.

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	....	....	....	67[a]	69	70	70	72	72	74	70	69	69
1891	67	64	65	70	69	72	73	74	74	74	73	70	70
1892	68	64	66	65	70	70	71	72	70	72	72	68	69
1893	67	66	65	67	70	72	74	73	74	73	70	67	70
1894	66	65	66	69	72	71	70	71	72	72	71	69	70
1895	66	65	66	68	70	74	74	73	74	73	71	71	70
1896	67	67	66	66	70	72	72	73	73	72	70	70	70
1897	68	67[b]	68	69	71	71[a]	72	72	72	72	71	70	70
1898	67	64	64	66[a]	70	70	72	73	73	72	70	69	69
1899	66	66	65	66	69	71	72	73	73	73	73	67	70
1900	67	66	65	69	71	72	72	72	73	72	71	70	70
Means	67	65	66	67	70	71	72	73	73	73	71	69	70

TABLE 13.—DEW-POINT, 3 P. M.

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	....	....	....	64[f]	69[e]	70[e]	71[d]	72[e]	72[d]	71[d]	70[e]	68[f]	70
1891	68[e]	65[d]	65[g]	69[d]	69[e]	72[e]	73[d]	74[f]	74[d]	73[d]	72[e]	69[f]	70
1892	67[g]	65[d]	65[d]	64[f]	70[f]	70[e]	71[e]	70[d]	72[d]	72[e]	72[e]	68[e]	69
1893	66[f]	66[d]	65[e]	67[f]	69[e]	72[e]	73[e]	73[e]	73[d]	71[e]	69[e]	68[g]	69
1894	66[f]	64[d]	65[f]	69[e]	72[f]	71[d]	70[e]	71[f]	72[e]	71[d]	71[e]	69[g]	69
1895	67[e]	65[d]	66[e]	68[e]	70[e]	74[f]	73[d]	73[e]	74[e]	74[e]	72[e]	70[g]	70
1896	68[e]	66[d]	66[e]	66[f]	70[g]	72[d]	72[d]	73[f]	72[d]	72[d]	70[f]	71[f]	70
1897	68[f]	66[d]	68[d]	68[f]	70[f]	71[g]	72[d]	72[f]	72[d]	72[e]	71[e]	70[f]	70
1898	66[f]	64[d]	64[d]	66[f]	70[g]	70[e]	72[f]	72[e]	72[e]	72[e]	70[e]	69[e]	69
1899	66[f]	65[d]	64[e]	66[f]	68[f]	70[d]	72[e]	72[d]	73[d]	73[e]	72[e]	67[g]	69
1900	67[e]	66[d]	65[d]	68[g]	70[e]	70[d]	72[e]	72[e]	72[e]	73[d]	72[e]	70[f]	70
Means	67	65	65	67	70	71	72	72	73	72	71	69	70

TABLE 14.—RELATIVE HUMIDITY, 9 A. M.

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	%	%	%	%	%	%	%	%	%	%	%	%	%
1890	....	....	....	73	66	72	72	78	81	75	72	73	73
1891	72	67	66	71	66	72	79	76	75	74	87	78	74
1892	77	71	57	64	74	71	59	73	70	72	79	73	70
1893	74	71	69	70	70	76	77	74	78	78	70	71	73
1894	71	69	71	73	74	70	70	69	73	78	75	76	72
1895	74	71	68	70	74	78	78	76	78	77	76	75	75
1896	73	71	69	68	72	74	74	76	73	73	73	75	73
1897	74	71	73	71	73	72	74	72	72	71	72	75	72
1898	71	66	63	64	69	68	74	74	74	73	73	73	70
1899	70	69	67	65	68	70	73	74	75	74	76	69	71
1900	71	71	66	70	70	71	73	64	71	73	70	75	70
Means	73	70	67	69	71	72	73	73	75	74	75	74	72

TABLE 15.—RELATIVE HUMIDITY, 3 P. M.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	%	%	%	%	%	%	%	%	%	%	%	%	%
1890	....	....	....	74	74	68	76	75	73	73	71	67	70
1891	68	62	60	67	68	69	73	73	75	62	76	69	68
1892	69	62	61	61	72	54	68	65	66	70	74	68	66
1893	67	64	61	67	67	71	72	68	71	73	67	70	68
1894	68	62	63	70	72	66	64	63	68	70	72	69	67
1895	67	61	61	64	69	74	71	71	75	78	74	68	69
1896	69	64	62	61	67	69	71	69	66	68	68	69	67
1897	65	61	65	70	69	68	69	66	66	65	68	70	67
1898	61	57	58	60	64	64	71	70	70	69	67	66	65
1899	62	60	60	57	61	65	68	72	70	68	69	61	64
1900	51	61	60	66	66	68	61	70	70	68	71	75	66
Means	65	61	61	65	68	67	69	69	70	69	71	68	67

TABLE 16.—PREVAILING WIND DIRECTION, 9 A. M.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	....	....	....	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.
1891	e	e.	e.	e.	e.	e.	e.	e.	e.	e.[a]	e.	e.	e.
1892	e.	ne.	e.	e.	e.	e.	e.	e.	e.	e.	e.	ene.	e.
1893	e.	ene.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.
1894	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	ne., e.	e.
1895	e.	e.	e.	e'	e.	e.	e.	e.	e.	e.	e.	ene., e.	e.
1896	e.	e.	e.	ene., e.	e.	ene.	e.	e.	e.	e.	e.	e.	e.
1897	e.	ene.	ene.	e.	ese.	e.[a]	ene.	e.	e.	e.	ene.	e.	e.
1898	ne.	e.	ene.	e.	e.	e.	e.	e.	ene.	e.	e.	e.	e.
1899	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	ne	e.
1900	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.
Prevailing direction	e.	e.	e.	e.	e.	e.	e.	e.	e.	e	e.	e.	e.

TABLE 17.—PREVAILING WIND DIRECTION, 3 P. M.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	....	....	....	e.[f]	e.[a]	e.[a]	e.	e.	e.	e.	e.	e.[b]	e.
1891	e.[c]	e.[b]	e.[g]	e.[d]	e.[b]	e.[c]	e.[f]	e.[i]	e.[d]	e.[c]	e.[c]	e.[f]	e.
1892	e.[g]	ne.[d]	e.[d]	e.[f]	e.[c]	e.[c]	ene.[c]	e.[c]	e.[d]	e.[c]	e.[c]	ene.[c]	e.
1893	e.[f]	e.[d]	ene.[c]	e.[f]	e.[c]	e.[c]	e.[c]	e.[c]	e.[d]	ene.[c]	e.[c]	e.[g]	e.
1894	e.[f]	e.[d]	e.[c]	e.[c]	ese.[c]	e.[d]	e.[c]	e.[c]	e.[c]	se.[d]	ene.[c]	ene.[g]	e.
1895	e.[c]	e.[d]	e.[c]	e.[f]	e.[c]	e.[f]	e.[d]	e.[c]	e.[c]	e.[c]	e.[c]	e.[g]	e.
1896	e.[c]	ene.[d]	ene.[c]	ene.[f]	e.[g]	ene.[d]	e.[d]	ene.[f]	e.[d]	ene.[d]	ene.[f]	e.[f]	ene.
1897	ene.[f]	ene., e.[d]	ene.[d]	e.[f]	e.[f]	e.[g]	e.[d]	e.[f]	e.[d]	e., ese.[c]	ene.[c]	e.[f]	e.
1898	ne.[f]	ene.[d]	ene.[d]	e.[f]	e.[g]	e.[c]	e.[c]	e.[c]	e.[c]	ene.[c]	e.[c]	e.[c]	e.
1899	e.[f]	e.[d]	e.[c]	e.[f]	e.[f]	e.[d]	e.[c]	e.[d]	e.[d]	e.[c]	e.[c]	ne.[g]	e.
1900	e.[c]	e.[d]	e.[d]	e.[g]	e.[c]	e.[c]	e.[c]	ene.[a]	ese.[c]	ene.[d]	e.[c]	e.[f]	e.
Prevailing direction	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.

TABLE 18.—AVERAGE DAILY WIND MOVEMENT.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	Miles.	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*
1894	233.5	273.5	217.9	202.5	128.2	252.3	271.7	....	....	....	169.8	138.7	198.4
1895	194.8	185.5	234.2	241.2	264.3	219.0	250.3	235.0	192.5	156.4	199.0	110.5	206.9
1896	166.1	194.0	229.5	212.6	222.7	248.8	238.5	187.0	138.2	111.8	239.3	167.9	196.4
1897	160.0	220.4	160.5	143.2	240.2[c]	266.7	222.1	230.4[d]	164.8	143.4	152.0	171.0	189.6
1898	195.0	167.0	197.0	245.0	186.0	268.5	209.0	199.5	146.0	117.0	138.0	169.0	186.4
1899	219.0	228.6	198.0	176.5	207.0	240.0	273.4	236.2*	184.3	93.6	106.2	92.0	188.0
1900	191.1	183.6	226.4	216.8	218.3	166.1	241.8	200.5	124.8	96.7	68.3	109.4	170.3
Means	194.2	207.5	209.1	205.4	209.6	237.3	243.8	214.8	158.4	119.8	153.2	136.9	190.9

*Anemometer out of order from August 7 to 21.

TABLE 19.—NUMBER OF DAYS WITH .01 INCH OR MORE RAINFALL.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	....	....	....	19	18	21	25	25	23	21	29	26	263
1891	28	22	9	13	18	23	25	23	25	25	29	27	267
1892	29	20	18	12	22	25	21	21	19	24	27	23	261
1893	19	19	21	17	16	22	27	22	26	21	17	29	256
1894	19	22	18	17	17	17	21	19	26	24	27	20	247
1895	19	10	20	15	22	19	26	26	27	27	22	19	252
1896	25	17	17	13	14	25	26	24	15	20	21	22	239
1897	18	16	17	12	20	22	21	23	20	18	24	25	236
1898	23	13	18	12	14	16	26	23	20	18	21	25	229
1899	28	21	14	8	11	23	23	20	20	19	22	12	221
1900	20	15	9	15	15	14	20	21	10	20	16	19	194
Average	22.8	17.5	16.1	13.9	17.0	20.1	23.7	22.5	21.0	21.5	23.2	22.5	242

TABLE 20.—NUMBER OF THUNDERSTORMS.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November	December.	Annual.
1890	.....	.....	.....	.....	.....	2	2	2	3	6	1	0	.....
1891	0	0	0	1	1	4	4	5	1	4	1	0	21
1892	0	0	0	0	0	3	0	1	3	2	2	0	11
1893	0	0	0	0	1	3	6	3	5	4	0	0	22
1894	0	0	0	0	2	3	0	0	3	4	0	1	13
1895	0	0	0	0	2	2	4	4	1	5	1	0	19
1896	0	0	0	0	2	2	3	3	4	2	1	0	17
1897	0	0	1	0	0	2	3	2	2	0	0	1	11
1898	0	0	0	0	0	1	2	5	5	1	0	0	14
1899	2	0	1	0	0	3	3	1	2	4	1	0	17
1900	0	0	0	1	0	1	2	1	0	3	0	0	8
Average	0.2	0	0.2	0.2	0.8	2.4	2.6	2.5	2.6	3.2	0.6	0.2	15.3

TABLE 21.—NUMBER OF EARTHQUAKES.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November	December.	Annual.
1890	.....	.....	.....	.....	.....	0	0	0	2	1	2	2	.....
1891	0	0	2	0	0	0	2	2	0	1	1	1	9
1892	0	0	0	0	1	1	0	1	1	1	0	0	5
1893	0	0	0	0	0	0	1	0	1	1	0	0	3
1894	0	2	0	0	2	3	1	2	0	0	0	0	10
1895	0	0	1	0	2	0	1	1	1	1	0	1	8
1896	1	0	2	0	0	1	0	0	1	0	0	0	5
1897	0	1	2	1	0	0	1	1	2	0	0	0	8
1898	2	1	2	1	0	0	0	0	1	0	0	0	7
1899	0	0	3	0	0	1	0	0	0	2	0	2	8
1900	0	0	1	1	0	0	1	1	1	3	2	1	11
Average	0.3	0.4	1.3	0.3	0.5	0.5	0.6	0.7	0.9	0.9	0.5	0.6	7.4

NOTE.—When the data for any month is missing, the average for that month has been used in obtaining the annual mean. The letters in the figure columns indicate the number of days missing from the record; for instance, "e" denotes five days missing.

NOTES BY THE EDITOR.

MR. ALEXANDER ASHLEY.

When the Editor came to the weather service in January, 1871, as civilian assistant to the Chief Signal Officer of the Army, his first acquaintance was Mr. Alexander Ashley, who was usually spoken of as Chief Clerk, although, strictly speaking, he was Chief of the Division of Correspondence and Records; and now, after more than thirty years of public service together, the Editor regrets to have to announce the death of his colleague. Mr. Ashley's official record is as follows:

Born at Pittsburg, Pa., May 31, 1831. Served as an enlisted man in the United States Army from May 10, 1861, to March 31, 1863. (Private Company I, Tenth Regiment, Pennsylvania Reserve Corps, May 10, 1861; Corporal August 12, 1862; detailed from the Army for signal duty August, 1861; assigned to Office of Chief Signal Officer March 19, 1862; discharged from Army March 31, 1863.) Appointed civilian clerk April 1, 1863. Died April 11, 1901.

Mr. Ashley was graduated from Allegheny College, at Meadville, Pa., which conferred upon him the degrees of A. B. and A. M. He enlisted and was ordered to Washington, D. C., at the outbreak of the war; was detailed for duty under Gen. A. J. Myer, and later assisted him in the formation of the meteorological service of the Signal Corps. All scientific papers passed through his hands; for several years he prepared and had printed lists of the principal scientific documents preserved in his files, which lists were a great convenience for reference in the daily work of the office. He was also the recorder and historian of the Veteran Signal Corps Association. On June 30, 1887, on account of his advancing age, he vacated the position then regarded as that of chief clerk and was assigned to less exacting work. From July, 1897, until his death, he was on duty as examiner with the United States Civil Service Commission, by detail from the Weather Bureau.

Animated by the highest ideals of duty, Mr. Ashley's life was one of great official activity and personal influence. Both in official and private life he adhered to the right without a trace of compromise. Often a great amount of work was suddenly imposed upon him and his assistants, and he never failed to hold himself to duty as strictly as he held his subordinates; withal he was as kind and considerate of the rights and feelings of others as any comrade or brother could be. Although essentially a business man, a soldier, and a churchman, yet, he knew also how to further the scientific interests of the meteorological service in minor details and in many ways the Weather Bureau has been benefited by his long and faithful career.

MR. CHARLES DAVIS.

Mr. Charles Davis died at Charlotte, N. C., April 26, 1901, after a brief illness. He was born in Wilmington, N. C., on April 24, 1870, and educated in the graded schools of Chatham, Va., being graduated from the Chatham High School. He entered the meteorological service of the Government on August 21, 1889, and served as an assistant at Vicksburg and Meridian, Miss., Pensacola, Fla., Galveston, Tex., New Orleans, La., and Memphis, Tenn. In June, 1894, while but 24 years of age, he was promoted to the important position of observer in charge and assigned to duty at Shreveport, La. Four years later he was placed in charge of the Charlotte station, where he continued on duty until his death. His record in the Bureau is an enviable one. In his meteorological work he attained a high degree of accuracy, for which he was several times officially commended. A few months ago his station was rigidly inspected and found to be in splendid condition. In the death of Mr. Davis the Weather Bureau sustains a distinct loss. His good work as an observer and his excellent qualities as a man will be long remembered.

LORIN BLODGET.

This eminent statistician and author of several works on meteorology died in Philadelphia, March 24, 1901. He was born in Jamestown, N. Y., May 25, 1823, and was educated at the academy in that place and at Hobart College, Geneva, N. Y. His interest in meteorology was aroused during the years 1841–1844 when traversing Wisconsin, Illinois, and Iowa for the purpose of examining and purchasing land. As one of the voluntary observers and correspondents of the Smithsonian Institution he attracted the notice of Prof. Joseph Henry, who (1851–1854) employed him in the reduction of the meteorological records that were rapidly accumulating. After a few years, owing to a difference of opinion as to his right to use these official records for his own publications, this arrangement was terminated. He subsequently prepared some of the climatological charts published in the reports of the Surgeon General, and in 1857 published his "Climatology of the United States," a book that attracted much attention and is still often quoted, although its different sections are of very unequal value.

At the Cleveland meeting of the American Association for the Advancement of Science, in 1853, he presented several papers on meteorology. In 1854–1857 he was employed in barometric hypsometry by the army engineers surveying the Pacific Railroad. The subsequent portion of his life was devoted to general statistics, and for a long time he was general appraiser of customs for Philadelphia. However, about 1890, he found time to make several reports to the Secretary of State for Pennsylvania, on the climatological records of that State. He is the author of about 150 volumes on economical, financial, and industrial matters, and perhaps 400 pamphlets, besides thousands of editorial articles.

He labored unselfishly to promote the public interests in widely varied fields, and his life, work, and character, remind us very much of his distinguished neighbor, Franklin B. Hough, who was born in northern New York a few years earlier.

HAWAIIAN WEATHER FOR FEBRUARY, 1901.

Mr. Curtis J. Lyons, in a letter dated April 17, 1901, gives the following account of the general weather conditions during February in the Hawaiian Islands:

The main feature of the month here was the great low that persistently hung around these islands from the 4th to the 14th. In fact, after a very clear day on the 1st, it clouded up on the 2d, beginning with wisps of cirri. The cloud movement you will have seen in my February report. The storm evidently came up from the south-southwest, as the wind was southeast, an unusual storm wind here, and shifted afterwards to southwest and even north, backing into southwest again. I am inclined to think the storm described a loop in its course. The steamer *Mariposa* met it two days or 600 miles northeast of here on the 6th. I think it moved off to the north-northeast then east, making the Oregon coast on the 15th, but without reports from ships at sea between these islands and the coast, this is merely a conjecture. The open question here is whether our storms usually move toward the Oregon coast or toward San Diego. The storm which your weather maps show as crossing the entire continent from San Diego to Maine during the above-mentioned period was, of course, another low and not this one. It would seem that important storm movements do take place at the same time in widely separated sections of the same hemisphere.

It seems a noticeable fact that most of the storms of the past two months in the United States have, to an unusual degree, moved from the southwest instead of from northwest.

There was a good deal of thunder and lightning during several days of this storm. The barometer was the lowest for twenty years, both for the storm and for the month.

I may be pardoned for introducing a theory of mine, which seems rather in accordance with facts, that during the years of minimum sunspot frequency there is an increase of solar heat. This first takes effect in equatorial regions causing a preponderance of northerly currents of air in the semitropical belt, thus producing a dry season. The next season we have increased heat in the semitropical belt, followed by a movement of air from the southwest and heavy rains. This is precisely what has taken place here within the last two or three years. This state of things might show at some places and not at others. The summer of 1900 was unusually warm here, and the rainfall from October 1 to April 1, 1900, was 35 inches, 10 inches above the normal for that period. A wet winter had been predicted.

I give this only for what it is worth, as possibly bearing on the variation of the average track of storms during the different years. In speaking of northerly currents of air, upper currents are particularly included.

I shall be happy to continue, as far as possible, to notice what connection may be apparent between lows here and lows on the coast. Inclosed is a specimen of monthly local report, also the daily weather item.

In his regular monthly local report for February, as published in the Pacific Commercial Advertiser, Honolula, March 1, Mr. Lyons gives the detailed records of the rainfall at all stations and a number of general items from which we copy the following:

Barometer average, 29.838; normal, 29.947 (corrected for gravity by —.06); highest, 30.11; lowest, 29.48; greatest 24-hour change, 0.22. The above is the lowest average, also the lowest single reading for twenty years. Lows passed this point on the 6th and 20th; highs on the 16th and 28th. * * *

The main feature of the month was the storm of February 4 to 14. This storm moved up from south-southwest, beginning here with a southeast gale, which is an unusual direction for storm winds around this group, this wind being called by the Hawaiians "makani kiu." Veering southwest after two days it became a regular "Kona," accompanied by electric storms, the barometer sinking to 29.48. The storm seems to have formed a loop in its course, as after moving away it returned again before finally going to the northward. Turning to the eastward it appears to have reached the Oregon coast about the 19th. Great damage was done, especially on the Maui and on the Kona and Konala slopes of Hawaii. Snow fell on the Hawaii mountains well below the timber line, 7,000 feet.

WEATHER BUREAU OFFICIALS AS INSTRUCTORS.

Mr. J. P. Bolton, Observer Weather Bureau, Fresno, Cal., states that the class in physical geography from the Fresno High School visited the Weather Bureau office on April 23 for instruction in the use of meteorological instruments. On April 26, at the request of Superintendent McLane, Mr. Bolton lectured to this class in the high school on weather forecasting and the daily weather map.

Mr. W. E. Donaldson, Observer Weather Bureau, Binghamton, N. Y., reports that he gave the pupils of the Free School of Union, N. Y., a lesson on local and general weather conditions and the preparation of daily weather maps, illustrated by the map of March 20, 1901. It is his intention to give frequent talks on meteorology to all the schools in his vicinity, along lines readily understood by pupils over fifteen years of age.

Mr. Alexander G. McAdie, Forecast Official, lectured upon the climatology of California, at the Students' Observatory, Berkley, Cal., on April 23.

Mr. F. L. McClintick, Observer, lectured before the Lewiston, Idaho, Commercial Club on April 3. His remarks were confined principally to temperature, and he exhibited and explained to his audience the various thermometers employed by the Bureau.

Mr. W. A. Shaw, Observer, states that he has recently completed a course of instruction in meteorology to the senior class in the Norwich University, Norwich, Vt. The course covers a period of eleven weeks, with two hours each week. Waldo's Elementary Meteorology is used as a text-book, but is supplemented by lectures on special subjects and by the study of Weather Bureau maps and charts. This course, which was established by Prof. Henry J. Cox, in 1887, is now a *required* study for the senior class. Mr. Shaw also lectured before the Norwich High School on Weather maps and weather forecasting, on April 19.

EARTHQUAKES IN MONTANA.

Mr. H. P. Dick, Observer at Kalispell, Mont., sends a clipping descriptive of an earthquake on the west shore of Flathead Lake, Mont., in latitude 48° north, longitude 114° west, from which we make the following extract:

For years occasional earthquake shocks have been noticed on the west shore of Flathead Lake, seeming to occur most frequently and be most perceptible in the vicinity of George Stanford's place about twenty miles south of Kalispell. They have never been heavy enough to do any damage. * * * There was another one last Friday afternoon that appears to have extended over a considerably greater distance than most of the previous ones; or at least it was noticed over a much greater distance. * * *

It is supposed that the shock affected a narrow strip of country on a line running from Foy's to Flathead Lake at a point several miles down the west shore.

The tremor was observed at a number of specified places on the west shore of the lake, but not at other places, so that we have here a very interesting case of local earthquakes evidently produced by the irregular settling or faulting of the local geological strata. Earthquakes are not a meteorological phenomenon, although many of our correspondents seem to consider them so, and it would not be proper for a meteorologist to attempt any explanation of their peculiarities. It is to be hoped that the geologists and the geological journals will give attention to them.

DUST STORMS IN BURMA AND ELSEWHERE.

A cablegram states that a violent dust storm visited Mandalay, Burma, on Tuesday, April 23, followed by a terrible rain storm. Great destruction was wrought and twelve lives were lost.

Almost every windstorm is accompanied by dust in proportion to the previous dryness and character of the soil, and is followed by rain in proportion to the moisture and temperature of the uprising atmosphere. So far as we have observed such storms in America, Africa, and Europe there are certain characteristics common to all that may possibly also be found in the storms of India. We do not usually associate a dust storm and a rain storm together; the dust storms of the Sahara are accompanied by immense black clouds, but rarely any dust. The dust storms of North America are accompanied by clouds, but are also generally followed by at least a slight rain, and frequently a heavy one. The dust whirls of central and northern India are generally described without reference to any clouds. It will be interesting to know whether this present dust storm in Burma was not simply the front of a broad mass of cool air sweeping southward in the afternoon from the hilly interior, raising the dust and the air in its front only to cool it and form cloud and rain in its rear.

THE PERMANENCE OF CLIMATE.

In the MONTHLY WEATHER REVIEW for March, 1901, page 121, we have quoted a very beautiful paragraph which we found in a charming lecture by Mr. A. F. Sims. It seems, however, that, without our realizing it, Mr. Sims was quoting from a lecture by Mr. J. R. Sage, Section Director, delivered on December 13, 1900, and published in the section report of the Iowa Weather and Crop Service for December. We regret very much that there should have been any failure to recognize the original authorship. As all of our readers know, the Iowa Monthly Review has for many years past illustrated the energy and literary ability of the dean of our Climate and Crop Service. The present little incident reminds us of the complaint made some years ago against certain passages in an astronomy written by a distinguished English astronomer. It appears that he had copied out some admirable paragraphs from our American astronomer, Newcomb, but when he came to incorporate them in his book quite forgot where they came from and concluded that they must have been original with himself.

FOG IN NEW YORK HARBOR.

We estimate that on the average the navigation of New York Harbor is seriously interrupted for about ten days in each year by dense fog. The reports for April 21, 22, and 23 state that, owing to the dense fog off the Jersey coast and over New York Bay and Harbor, scarcely half a dozen sailing vessels entered or left the port during these three days. Most of the large passenger steamers were also lost in the fog and waited a day or two outside the bar or at their docks. Only between the hours of 10 and 12 did it clear sufficiently to justify these expensive vessels in risking any attempt to move.

Even though the above press reports be somewhat exaggerated still they present matter for very serious consideration. We have in the MONTHLY WEATHER REVIEW for January, 1899, described the so-called Tugrin fog dispeller, and lately read of improved apparatus for communication through the fog; we are also told that if one can go to the topmast, or perhaps higher, he will rise above the fog; but all these devices fail to meet the real needs of the case, which require the utter abolishment of the fog.

We have no doubt but that the fog is really worse now than it was in former years and that this is due principally to the steam and smoke from innumerable chimneys. Either these must be modified or suppressed or else the wharfs of New York must be built far away from the smoke and fog of the city.

SLEET.

The Weather Bureau frequently receives inquiries as to the damage done by sleet and the frequency and geographical distribution of sleet storms. But it has always been difficult to collect together a sufficient quantity of data on this subject to justify any extensive generalizations. The following account of the sleet storm of March 11 and 12 is taken from the Report of the Michigan Section of March, 1901. The Editor will be greatly obliged to any one who can refer him to a general discussion of the frequency and severity of such storms in any part of the country. On the other hand, he would highly appreciate it if any of the section directors would communicate to the MONTHLY WEATHER REVIEW some general statistics for the respective sections.

The heavy storm of snow, sleet, hail, and wind, which prevailed most heavily in the western half of the lower peninsula during March 11 and 12, did great damage to telephone and telegraph lines, interfered with railroad traffic, and in the case of the railroads running north from Grand Rapids tied up all service for over a day. The greatest havoc occurred in the large cities, notably Detroit, Saginaw, Battle Creek, Kalamazoo, and Grand Rapids, where telephone poles were broken down by the heavy sleet and wires thrown in a tangled mass into the streets; the damage was especially severe in Battle Creek. On March 12 most of the northern divisions of the Pere Marquette Railroad and Grand Rapids and Indiana Railway were completely blocked; railroad men say that the storm was one of the most dangerous known and the worst that they had experienced for many years; the sleet was of bird-shot size which melted as it fell and then crusted between the rails, coating and covering the steel so that the flangers had great difficulty in making headway; the ordinary snow plow was of no use whatever. The greatest difficulty occurred in the so-called snow belt on the Grand Rapids and Indiana Railway in the vicinity of Mancelona, and near Grawn and Traverse City on the Pere Marquette Railroad.

RAINFALL AND GRAZING.

According to Mr. A. B. Wollaber, in the January Report of the Oregon Section, a careful estimate has been made in Australia on the relation of rainfall to the number of sheep capable of obtaining sustenance on a square mile of semiarid land. Up to a rainfall of 10 inches per annum, as many sheep can thrive on a square mile as there are inches of rainfall. When the rainfall is above 10 inches the ratio rapidly increases so that twenty sheep per square mile can be supported when the rainfall is 13 inches per annum and about seventy sheep when the rainfall is 20 inches per annum.

THE FIRST NUMBER OF THE MONTHLY WEATHER REVIEW.

Some bibliographers may have noticed in the list of Weather Bureau publications a statement to the effect that MONTHLY WEATHER REVIEWS have been published since July, 1872. The more precise statement is that the publication began with the REVIEW for 1873, since which time it has appeared regularly and been very widely distributed. The first copy and the initial steps toward the regular publication were taken by the present Editor, but subsequent numbers were prepared by various officials, alternately. The general rule was that the forecast official for the month prepared the REVIEW for that month, but, of course, as a variety of duties multiplied and the scope of the REVIEW increased, the work of the editor was often limited to a very general supervision of the work done by the clerks of the REVIEW room; the personality of the editor did not enter into the REVIEW quite as clearly as it has done during the past few years.

When the Annual Report for the fiscal year ending June 30, 1873, was being prepared (and such work was always done by one of the assistants of the Chief Signal Officer) it was considered desirable to insert a reprint of the MONTHLY WEATHER REVIEWS for the six months, January-June, and also similar REVIEWS for the preceding six months. These latter were prepared by Mr. Calver, who was the clerk in charge of the Farmers Weekly Bulletin. Three of them, viz., those for October, November, and December were completed in time for publication in the Annual Report; those for the three months, July, August, and September, 1872, were filed as manuscripts and remained unprinted until 1888, when they were printed for the purpose of binding up a few sets of the MONTHLY WEATHER REVIEW, for use in the Central Office and at the larger stations. It is, therefore, proper to say that the regular publication of the MONTHLY WEATHER REVIEW began with the number for January, 1873, and that the earlier numbers were written up and printed subsequently.

BOMBARDMENT OF HAILSTORMS.

In reply to a query from the editor of the American Agriculturist, the Chief of Bureau has lately sent the following reply, which embodies the present state of our knowledge as to the value of cannonading as a means of preventing hail. This extract is printed for the general information of others:

You ask whether the Department of Agriculture is planning to make any test of the French method of bombarding the clouds to prevent hailstorms; if so, when and where and how many? What do you think of this idea, any way?

The method you speak of is undoubtedly based upon popular delusions, and has spread throughout Italy, southern Austria, and southern France. It is practised by the owners of vineyards, and is especially exploited by the firm of Greinitz, Neffen, manufacturers of iron works, Gratz, Austria. The inventor of the apparatus is Mr. Stiger, and the method is ordinarily spoken of as the Stiger method. It consists essentially in sending vortex rings of smoke and air upward toward the clouds; but the most powerful Stiger cannon that have yet been employed do not send these rings higher than 1,200 feet above the ground, and, therefore, utterly fail to reach the clouds. On this account the distinguished Austrian meteorologist, J. M. Pernter, has maintained that if there is any virtue whatever in the idea, the experimenters must use much more powerful apparatus. But there is no satisfactory evidence that the cannonading or the vortices had any influence whatever on the hail. Both theory and practise agree in this conclusion. Theoretically it was imagined by Mr. Stiger that hail is formed in quiet spots in the atmosphere where the atmospheric moisture could crystallize out in large crystals in a manner analogous to the formation of large crystals of salt in liquid solution. But this is a very foolish notion; there are no such quiet spots in the atmosphere, and hailstones are not crystals but masses of ice, with only a feeble or partial crystalline structure. Even the perfect crystals of the snowflakes are formed in the midst of rapidly-moving air, so that the whole theoretical basis for hailstorm cannonading falls to the ground.

It is generally difficult to prove that a specific fall of hail has been especially influenced by the cannonading. Hailstorms are generally very local and erratic; some have maintained that they are controlled by the hills and contour of the ground or by the presence of forests and lakes, but practically the whole question is one of the ascending and descending currents of air that characterize whirlwinds and thunderstorms. If in the midst of these complex motions with the resulting rain there occur here and there patches of hail, it would seem absurd to say that we can put our finger upon the precise influence that caused or prevented hail. If in the midst of a hailstorm I fire off a cannon and the hail ceases to fall on my land but continues to fall on my neighbor's, it would be folly in me to maintain that this is due to the firing of my gun. Nothing but the continued repetition of this phenomenon, under a variety of circumstances, would justify such conclusions. Now, the fact is that in the various reports relative to hail shooting there has not been a fair presentation of the statistics of the results. Nothing is told us as to where the hailstorms come from or go to, nor even whether there were any hailstorms, but in most cases the record simply says that a threatening cloud was seen approaching, the cannonade began and continued until the cloud went away, and no hail fell on the region supposed to be protected by the cannon. But this is not all, the last congress on the bombardment of hail utterly refused to entertain reports from those who testified that the hail fell in spite of the cannonade. In fact, therefore, reports showing that in no case was the cannonading of any avail had to be published independently.

After examining all that has been published during the past two years, my conviction is that we have here to do with a popular delusion as remarkable as is the belief in the effect of the moon on the weather. The uneducated peasantry of Europe seem to be looking for something miraculous. They would rather believe in cannonading as a means of protection and spend on it abundance of money, time, and labor, than adopt the very simple expedient of mutual insurance against the losses that must inevitably occur.

After the experience this country has had during the past ten years with such rain-makers as Dyrenforth, Melbourne, and others, I am loath to believe that the bombardment of hailstorms will ever be practised, or even attempted in the United States, much less encouraged by the intelligent portion of the community. Every effort should be made to counteract the spread of the Italian delusion, which seems to have been imported into this country by the unfortunate publication of the reports of the United States consul at Lyon, France.

I trust that the columns of the American Agriculturist will discuss the subject with sufficient fulness to enable the farmers to see that the great processes going on in the atmosphere are conducted on too large a scale to warrant any man or nation in attempting to control them. The energy expended by nature in the production of a hailstorm, a tornado, or a rain storm, exceeds the combined energy of all the steam engines and explosives in the world. It is useless for mankind to combat nature on this scale. Fortunately, the destruction by hail, lightning, floods, etc., is usually confined to small regions.

SAND DUNES AND THE WIND.

The piles of light sand along the coasts of the oceans and lakes are frequently driven forward by the wind, forming so-called dunes, which are in continual motion, traveling as fast as the wind can carry up the sand on the windward side and deposit it on the leeward side of the mound. This perpetual renewal of the windward and leeward surfaces prevents the growth of vegetation quite independently of the extreme dryness of the sand. Such dunes, either of sand or fine soil, have been encroaching on the Valley of the Nile from time

immemorial. They are also found traveling over the valleys of the Euphrates and Tigris, covering up the cities and the civilization of Assyria and Babylonia. Along the coast of Denmark, many parts of England and southwestern France, the Atlantic coast of Long Island and North Carolina, and on the shores of Lakes Michigan and Erie, such dunes are well known. In order to diminish their steady motion the most successful method has been to set out, or sow the seeds of grasses with very long roots. As this grass spreads rapidly and every joint that is buried becomes a new center for roots, it soon makes a protective covering and checks the moving sand. The movement of sand dunes as modified by wind and rain and frost would form an excellent subject for exact investigation by some observer.

THE GLACIER AS AN INDEX OF CLIMATE.

In the search for natural phenomena that sum up the total effect of the seasons from year to year, meteorologists have sometimes used the statistics of the condition of the glaciers, just as the botanists have been accustomed to use the statistics of the annual rings of growth of trees. If a glacier is increasing in volume year by year, this is considered as an evidence that the quantity of snow and, therefore, the cold is increasing, or the quantity of heat is diminishing. But a glacier is the result of complex conditions; it may easily happen that on one side of a mountain range the glaciers are increasing, while on the opposite side they are simultaneously decreasing. The growth of a glacier is favored by the fall of snow, sleet, and hail and by the prevalence of cool, cloudy weather, and these conditions depend quite as much on the direction of the wind as on the temperature. Those who look to the glaciers to tell them whether, at the present time, the climate is becoming colder or warmer, will be interested in the statement taken from Nature of April 4, 1901, p. 547, to the effect that the survey of Swiss glaciers made since 1897 shows that out of fifty-six cases thirty-nine are diminishing in size, five are stationary, and twelve are increasing. These three classes represent the three types of locations in which, during these past few years, local conditions have been, respectively, favorable or unfavorable to the growth of a glacier. As they stand they tell us very little as to whether the general climatic conditions are more or less favorable to glaciers than formerly, and, indeed, nothing as to whether temperature, snowfall, or rain has produced the variations in the glacier.

AN OLD RECORD AT PENSACOLA, FLA.

In the first volume of the transactions of the American Philosophical Society of Philadelphia is a very interesting letter from Dr. J. Lorimer, of Pensacola, "West Florida," from which it appears that about 1768 he kept a record of his Fahrenheit thermometer three times a day for a whole year. The Editor is very desirous of obtaining some clew to this ancient temperature record. Dr. Lorimer states that his extremes range between 17° and 98° F.

It is greatly to be hoped that his manuscript record has escaped the ravages of time. As he was then surgeon to the British troops at this station it is possible that his record is still preserved in the British archives in London.

THE KITE WORK OF THE GERMAN ANTARCTIC EXPEDITION.

We have received information to the effect that the German South Polar Expedition will systematically make kite ascensions in the trade winds from aboard ship during the southward journey, and continue the work in the antarctic regions.

The expedition is fully equipped with aerial apparatus, all substantially of the Weather Bureau pattern, and the scheme will be that followed at Washington, with modifications required by the conditions and resulting from extensive experiments with the Weather Bureau outfit at the Deutsche Seewarte.

The kites are of three sizes, the large Marvin, like those used by the Weather Bureau of $6\frac{1}{3}$ square meters surface, Hargrave kites of 4 and $2\frac{3}{4}$ square meters surface, and light Eddy kites of $2\frac{3}{4}$ square meters, which are very advantageously employed in lifting and sustaining the larger kites with the instruments in light winds.

This appears to be the first occasion on which preparations have been made for the systematic exploration of the upper air conditions in the polar regions.

During the cruise of the U. S. S. *Pensacola* to Africa and back, October, 1889–May, 1890, the editor attempted to measure the actual linear velocity of the winds at sea by the observation of small balloons filled with hydrogen gas. These were set free from the stern of the vessel, and it was expected they would rise and be carried by the free wind in such a direction as to be easily observed with the sextant. Curiously enough, however, as the vessel was under sail these balloons became entangled in the currents about the sails, and we were never able to get a single satisfactory observation. Balloons of very considerable size would be necessary in order to free themselves from the disturbances produced by the sails. We very much hope that better fortune awaits the kite experiments on board of the German vessels.

AVERAGE TEMPERATURE OF UPPER STRATA.

According to Ciel et Terre, May 1, 1901, p. 130, and the Paris Comptes Rendus, November 26, 1900, p. 920, Monsieur L. Teisserenc de Bort has deduced from 240 ascensions of sounding balloons in 1898, 1899, and 1900, at the Meteorological Observatory at Trappes, the results given in the following table, showing the monthly mean temperatures at Paris and in the atmosphere above it:

Month.	Monthly mean temperatures.			Total diminution.	
	On the ground.	5,000 meters.	10,000 meters.	5,000 meters	10,000 meters.
	°	°	°	°	°
January	5.4	−15.3	−47.6	20.7	53.0
February	1.0	−21.8	−53.4	22.8	54.4
March	0.9	−20.9	−53.7	21.8	54 6
April	5.3	−18.4	−49.3	23.7	54.6
May	7.0	−16.8	−51.3	23.8	58.3
June	14.2	− 8.8	−45.3	23.0	59.5
July	15.7	− 8.7	−44.5	24.4	60.2
August	17.8	− 7.2	−41 8	25.0	59.6
September	13.4	− 9.7	−47.9	23.1	61.3
October	10.2	−11.0	−45.1	21.2	55 3
November	3.8	−12.8	−45.2	16 6	49.0
December	0.9	−18.9	−52.4	19.8	53.3

From these figures, which are apparently much more reliable than those given on page 415 of the MONTHLY WEATHER REVIEW for September, 1899, Monsieur Teisserenc de Bort draws the following conclusions:

(1) At 10,000 meters altitude the temperature has a decided annual variation. (The range of monthly means is 11.9, as compared with 16.9 at the earth's surface.)

(2) The amplitude of the annual variation diminishes with altitude.

(3) The epochs of maximum and minimum temperatures are retarded as the altitude increases.

(4) The differences of temperature from day to day can be larger at 7,000 or 8,000 meters altitude than those experienced at the same time near the ground.

(5) Temperature decreases far more rapidly in the neighborhood of a center of depression than elsewhere; this decrease can in certain cases amount to 0.9° C. per 100 meters.

(6) In a large number of areas of high pressure, but not in all, the diminution of temperature goes on as follows: From the ground up to 1,500 meters or 2,000 meters the temperature changes but little and often rises, after which it commences to diminish normally, and finally at 9,000 or 10,000 meters the gradient is about 1° per 100 meters. If we compare these facts with those that occur in areas of low pressure, we see that a vertical gradient has the following characteristics: The lower parts of barometric depressions, are often warmer than those of the areas of high pressure; after ascending a few hundred meters, within the area of low pressure, the rapid diminution brings us to temperatures that are lower than in the area of high pressure. Thus, the central part of a depression as at 3,000 or 4,000 meters altitude is ordinarily colder than the corresponding part of an area of maximum pressure. This fact had already been shown by Hann, but the sounding balloons, while confirming this first result, show that still higher up the temperatures again tend toward equality, which is a very important consideration in determining the forms of the upper isobars.

Similar conclusions based on more accurate observations, are also given in the great work of Assmann and Berson Wissenschaftliche Luftfahrten, 3 volumes, Braunschweig, 1900.

ERRATA.

In the MONTHLY WEATHER REVIEW for March, 1901, p. 122, please strike out under the heading "errata" the last item: "line 25 from bottom, for 530° read 562°." The original text was correct.

Prof. F. Pockels has sent us the following corrections to his article on "The theory of the formation of precipitation on mountain slopes" in the current number of the REVIEW; but, unfortunately, they were received too late to be incorporated in the text:

Page 156, column 2, line 8 from the bottom, for "$x = -6.3$," read "$x = -1.3$."

Page 157, column 2, right-hand side of the second equation from bottom, for $\frac{1}{q}\left(e^{\frac{q\eta}{2}} - e^{-\frac{qn}{2}}\right)$

read $\frac{1}{q}\left(e^{\frac{q\eta}{2}} - e^{-\frac{q\eta}{2}}\right)$.

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Professor of Meteorology

CHARACTERISTICS OF THE WEATHER FOR APRIL.

April, 1901, was characterized by unusually high pressure in the Lake region and over New England, a heavy rainfall along the Appalachians and eastward to the Atlantic, high temperatures over the northern third of the country, and cold weather in the South Atlantic and Gulf States. Precipitation was also in excess of the normal in the Rocky Mountain region and over the major portion of the southern Plateau, as was the case in the corresponding month of 1900.

Heavy snow, mixed with rain, fell along the Appalachians and in the upper Ohio Valley on the 20th and 21st, causing floods in the Allegheny and upper Ohio rivers during the latter part of the month.

Another striking characteristic of the month was the absence of thunderstorms and violent local storms. The number of thunderstorms that occurred in April, 1900, was 2,617; less than a tenth of that number was reported during the current month.

Interlake navigation began about April 8, but owing to a heavy ice gorge which formed at the foot of Lake Huron, passage into or out of that lake at its southern end was effectively blocked until the 26th of the month.

PRESSURE.

The distribution of monthly mean pressure is graphically shown on Chart IV and the numerical values are given in Tables I and VI.

The most striking feature in the distribution of mean pressure is the apparent shifting eastward of the area of high pressure which in a normal month is found over the Dakotas and the Northwest and the absence of the ridge of high pressure that usually extends from the south Atlantic coast northwestward to the Dakotas. Owing to the persistence of areas of low pressure along the Atlantic coast, monthly mean pressure was least off Chesapeake Bay, with mean values of 29.94 inches. As compared with the preceding month, pressure rose about a quarter of an inch in the upper Lake region and as much as three-tenths of an inch over the mouth of the St. Lawrence. There was a fall in monthly mean pressure over the Plateau region and also over the South Atlantic States, the greatest fall being a little more than a tenth of an inch. It was also below normal along the middle and south Atlantic coasts and in the Plateau region. Pressure was largely in excess of the normal over New England, the Canadian Maritime Provinces, the Lake region, and also along the Pacific coast.

TEMPERATURE OF THE AIR.

The distribution of monthly mean surface temperature, as deduced from the records of about 1,000 stations, is shown on Chart VI.

The month was cold and backward in the South Atlantic States, the Ohio Valley, the lower Mississippi Valley, and the Southwest. The greatest negative departures, viz, 6° to 8° daily, were recorded in South Carolina, northern Georgia, and western North Carolina. The month was warmer than usual in New England and thence westward to the upper Missouri Valley, positive departures of 7° being registered in portions of that region. Temperature was below normal west of the Rocky Mountains and over the middle and southern slopes. Maximum temperatures of 100° were recorded in the lower Rio Grande Valley and in Arizona and the desert

regions of California. A maximum temperature as high as 80° was not registered along the Atlantic coast north of Florida nor in New England and the lower Lake region.

Minimum temperatures of 32° or less were registered from eastern Tennessee and northern Georgia, northeastward to the White Mountains and northern and central Maine. In the lower Lake region minimum temperatures as low as 20° were registered at some distance from the lakes. Along the lakes, however, no minimum temperature lower than 30° was observed. In the Rocky Mountain region temperatures as low as zero were observed along the higher elevations.

The average temperature for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	43.5	+ 0.6	− 3.3	− 0.8
Middle Atlantic	12	49.3	− 1.4	− 4.0	− 1.0
South Atlantic	10	56.2	− 5.8	−11.0	− 2.8
Florida Peninsula	7	66.5	− 4.3	−12.1	− 3.0
East Gulf	7	61.5	− 4.9	−10.0	− 2.5
West Gulf	7	63.8	− 3.3	+ 0.5	+ 0.1
Ohio Valley and Tennessee	12	51.3	− 4.7	− 8.7	− 2.2
Lower Lake	8	45.5	+ 0.8	− 4.8	− 1.2
Upper Lake	9	43.5	+ 3.3	+ 2.4	+ 0.6
North Dakota	8	45.1	+ 3.5	+15.8	+ 4.0
Upper Mississippi Valley	11	51.4	+ 0.3	+ 1.9	+ 0.5
Missouri Valley	10	51.6	+ 0.7	+10.5	+ 2.6
Northern Slope	7	44.9	+ 0.3	+ 8.7	+ 2.2
Middle Slope	6	52.0	− 2.2	+ 0.7	+ 0.2
Southern Slope	6	58.5	− 2.6	+ 1.1	+ 0.3
Southern Plateau	15	52.2	− 2.5	+ 5.6	+ 1.4
Middle Plateau	9	46.5	− 1.1	+ 8.3	+ 2.1
Northern Plateau	10	45.0	− 1.2	+ 6.6	+ 1.6
North Pacific	9	46.2	− 2.5	+ 9.1	+ 2.3
Middle Pacific	5	52.5	− 1.9	+ 1.3	+ 0.3
South Pacific	4	57.0	− 1.6	+ 5.4	+ 1.4

In Canada.—Prof. R. F. Stupart says:

The mean temperature of April was higher than the average over the Dominion from Manitoba eastward, the positive departure ranging between 3° and 6° in nearly all districts, southwestern Ontario and western Manitoba alone showing somewhat smaller departures. In the Northwest Territories the mean temperature was very nearly normal, and in British Columbia there was a minus departure of from 1° to 3°.

PRECIPITATION.

The month as a whole was unusually rainy, except in the Mississippi Valley, the lower Ohio and the lower Missouri valleys. More than the normal amount of rain fell in the Rocky Mountain region and westward to the Pacific. The rainfall in western Nebraska, Kansas, western Oklahoma and northern Texas was also considerably in excess of the normal values, while along and east of the Appalachians, excepting only a narrow fringe along the coast of the Carolinas and Georgia, the rainfall was from 2 to 3 inches in excess of the normal. On the southern New England coast rainfall was about 5 inches in excess of the average amount.

Heavy snow fell in the lower Lake region, western Pennsylvania, eastern Ohio, West Virginia, and throughout the Appalachian region, in western North Carolina, and eastern Tennessee. There was also a greater amount of snow than usual in eastern Kansas and throughout the central Rocky Mountain region.

The distribution of snowfall is shown by Chart IX.

SLEET.

The following are the dates on which sleet fell in the respective States:

Alabama, 1, 19. Arizona, 4, 17. Arkansas, 1, 8. California, 2, 3, 9, 13, 14, 25, 28, 29, 30. Colorado, 2, 16. Connecticut, 3. Georgia, 1, 20, 21. Illinois, 1, 2, 18, 21, 22. Indiana, 2, 18, 21. Iowa, 2, 5, 16. Louisiana, 17. Maine, 3, 10. Michigan, 2, 17, 18, 21. Minnesota, 3, 5, 16. Missouri, 1, 16, 17, 18, 27. Nebraska, 1, 15, 16, 17, 18, 19. Nevada, 2. New Hampshire, 3. New Jersey, 3. New Mexico, 4. New York, 3, 7, 8, 9, 15, 19, 20. North Carolina, 1, 2, 20. North Dakota, 4, 11. Ohio, 2, 3, 18, 19, 20, 21, 24. Oklahoma, 16, 17. Oregon, 2, 3, 5, 6, 7, 30. Pennsylvania, 2, 20. Rhode Island, 13. South Dakota, 1, 2, 4, 15, 18. Tennessee, 1, 2, 3, 18, 19, 20, 21. Utah, 3, 6, 7, 10, 15, 16, 17. Vermont, 3. Virginia, 1, 2, 13, 20. Washington, 1, 2, 3, 5, 6, 23. Wisconsin, 5. Wyoming, 7, 13, 23.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 1, 28. Arizona, 1, 6, 10, 16, 17. Arkansas, 1, 8, 10, 12, 13, 17. California, 2, 3, 6, 29, 30. Colorado, 1, 3, 4, 8, 9, 12, 23. Connecticut, 23. Delaware, 2, 3, Florida, 30. Georgia, 1, 13, 20. Idaho, 1, 2, 3, 4, 6, 7, 14. Illinois, 17. Indiana, 1, 2, 17, 18, 28. Iowa, 2, 16, 17, 27, 28. Kansas, 5, 8, 10, 11, 12, 26. Kentucky, 2, 18. Louisiana, 10, 17, 18, 25. Maryland, 14, 20. Massachusetts, 26. Michigan, 2, 21. Minnesota, 27. Missouri, 5, 12, 13, 17, 25, 27, 28. Montana, 2. Nebraska, 1, 16, 23, 26. Nevada, 2, 3, 6, 7, 8, 14, 30. New Mexico, 10, 24, 28, 30. New York, 3, 5, 8, 9, 19, 20, 22, 26. North Carolina, 23. North Dakota, 26, 27. Oklahoma, 10, 11, 15, 17, 26, 27. Oregon, 1, 2, 3, 4, 5, 6, 7, 14, 20, 24, 25, 26, 27, 28, 29, 30. Pennsylvania, 3, 20. South Dakota, 18, 23, 26, 27, 29. Texas, 9, 17, 26, 28. Utah, 2, 3, 4, 9, 14, 15, 16. Washington, 1, 2, 3, 4, 5, 6, 11, 13, 14, 20, 21, 22, 23, 25, 28, 29. Wisconsin, 21.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	10	6.20	197	+3.0	+0.5
Middle Atlantic	12	5.08	155	+1.8	−2.1
South Atlantic	10	3.61	103	+0.1	−1.7
Florida Peninsula	7	1.61	67	−0.8	+0.8
East Gulf	7	5.80	132	+1.4	+0.5
West Gulf	7	2.94	77	−0.9	−5.5
Ohio Valley and Tennessee	12	4.21	105	+0.2	−5.4
Lower Lake	8	2.96	125	+0.6	−0.8
Upper Lake	9	0.93	40	−1.4	−2.3
North Dakota	8	1.15	59	−0.8	−1.4
Upper Mississippi Valley	11	1.65	56	−1.3	−2.2
Missouri Valley	10	2.07	67	−1.0	−1.5
Northern Slope	7	2.04	124	+0.4	0.0
Middle Slope	6	2.99	143	+0.9	−0.5
Southern Slope	6	2.61	118	+0.4	+1.4
Southern Plateau	15	0.37	79	−0.1	+0.9
Middle Plateau	9	0.98	91	−0.1	0.0
Northern Plateau	10	1.08	78	−0.3	−1.0
North Pacific	9	5.77	129	+1.3	+0.6
Middle Pacific	5	2.64	108	+0.2	+0.4
South Pacific	4	1.02	72	−0.4	+1.5

In Canada.—Professor Stupart says:

Except in the western portions of the Northwest Territories and in Prince Edward Island, the precipitation was very generally in excess of the average; however, there were no very pronounced positive departures, except locally in the Maritime Provinces and between Regina and Brandon in the northwest, in which latter district there was an unusually heavy snowfall between the 14th and 15th, when 18 inches fell at Qu'Appelle. In Ontario the heaviest precipitation occurred near Lake Ontario, and the most abnormal feature was a snowfall of between 4 and 6 inches, which occurred on the 20th, in connection with a storm movement northward across the Middle States.

HUMIDITY.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	81	+9	Missouri Valley	66	+1
Middle Atlantic	68	+1	Northern Slope	62	+5
South Atlantic	66	−6	Middle Slope	64	+9
Florida Peninsula	68	−7	Southern Slope	55	+2
East Gulf	64	−8	Southern Plateau	33	+3
West Gulf	69	−3	Middle Plateau	47	+3
Ohio Valley and Tennessee	69	+5	Northern Plateau	60	0
Lower Lake	72	+2	North Pacific Coast	74	−5
Upper Lake	71	−3	Middle Pacific Coast	65	−9
North Dakota	73	+5	South Pacific Coast	67	−2
Upper Mississippi	65	0			

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

The averages for the various districts, with departures from the normal, are shown in the table below:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	7.4	+2.1	Missouri Valley	5.1	−0.3
Middle Atlantic	6.6	+1.4	Northern Slope	5.2	−0.2
South Atlantic	4.7	+0.3	Middle Slope	5.2	+0.8
Florida Peninsula	3.3	−0.6	Southern Slope	4.2	0.0
East Gulf	4.5	0.0	Southern Plateau	2.7	+0.4
West Gulf	4.6	−0.6	Middle Plateau	4.8	+0.3
Ohio Valley and Tennessee	6.0	+0.7	Northern Plateau	5.4	−0.9
Lower Lake	6.0	+0.5	North Pacific Coast	6.1	−0.4
Upper Lake	5.2	−0.5	Middle Pacific Coast	3.7	−0.9
North Dakota	5.6	+0.1	South Pacific Coast	3.3	−0.6
Upper Mississippi	5.1	−0.4			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Abilene, Tex	4	50	w.	Memphis, Tenn	5	52	sw.
Do	5	50	w.	Moorhead, Minn	3	54	se.
Amarillo, Tex	4	80	nw.	Mount Tamalpais, Cal.	6	61	nw.
Do	5	58	nw.	Do	7	53	nw.
Atlanta, Ga	19	56	nw.	Do	13	55	nw.
Do	20	54	nw.	Do	16	50	nw.
Block Island, R. I	3	51	e.	Do	20	56	nw.
Do	15	56	ne.	Do	21	60	nw.
Do	16	63	ne.	Do	24	50	nw.
Do	26	54	ne.	Do	25	75	nw.
Charleston, S. C	19	50	se.	Do	26	56	nw.
Chattanooga, Tenn	18	55	s.	Do	28	50	s.
Chicago, Ill	21	56	ne.	Nantucket, Mass	15	54	ne.
Cleveland, Ohio	20	60	n.	Do	16	50	ne.
Detroit, Mich	20	52	ne.	New York, N. Y	1	52	nw.
Eastport, Me	4	54	e.	Do	7	50	nw.
Do	7	51	e.	Do	21	50	se.
El Paso, Tex	1	56	sw.	Point Reyes Light, Cal.	6	60	nw.
Do	4	74	w.	Portland, Me	3	50	ne.
Fort Smith, Ark	5	52	sw.	Do	7	50	ne.
Huron, S. Dak	3	63	se.	Wichita, Kans	5	52	nw.
Do	26	56	se.	Winnemucca, Nev	2	59	sw.
Lincoln, Nebr	5	60	n.	Yankton, S. Dak	26	50	s.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 1,202 thunderstorms were received during the current month as against 2,617 in 1900 and 1,597 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 28th, 100; 16th, 86; 12th, 81.

Reports were most numerous from: Missouri, 126; Kansas, 102; Colorado, 93.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz: March 30 to April 7.

In Canada.—Auroras were reported as follows: Father Point, 13th; Port Arthur, 24th; Medicine Hat, 23d; Victoria, 12th.

Thunderstorms were reported as follows: Winnipeg, 25th, 26th; Battleford, 30th; Victoria, 20th; Hamilton, Bermuda, 7th, 22d, 23d.

DESCRIPTION OF TABLES AND CHARTS.

By Alfred J. Henry, Professor of Meteorology.

Table I gives, for about 145 Weather Bureau stations making two observations daily and for about 25 others making only one observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation, the total depth of snowfall, and the mean wet-bulb temperatures. The altitudes of the instruments above ground are also given.

Table II gives, for about 2,700 stations occupied by voluntary observers, the highest maximum and the lowest minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station; the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (....).

Table III gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions based on these two observations only and without considering the velocity of the wind The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I. By adding the four components for the stations comprised in

any geographical division the average resultant direction for that division can be obtained.

Table IV gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table V gives a record of rains whose intensity at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes..	5	10	15	20	25	30	35	40	45	50	60	80	100	120
Rates pr. hr. (ins.)..	3.00	1.80	1.40	1.20	1.08	1.00	0.94	0.90	0.86	0.84	0.75	0.60	0.54	0.50

In the northern part of the United States, especially in the colder months of the year, rains of the intensities shown in the above table seldom occur. In all cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest rainfall of any single storm has been given, also the greatest hourly fall during that storm.

Table VI gives, for about 30 stations furnished by the Canadian Meteorological Service, Prof. R. F. Stupart, director, the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

Table VII gives the heights of rivers referred to zeros of gages.

NOTES EXPLANATORY OF THE CHARTS.

Chart I, tracks of centers of high areas, and Chart II, tracks of centers of low areas, are constructed in the same way. The roman numerals show number and chronological order of highs (Chart I) and lows (Chart II). The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the 8 a. m. and 8 p. m., seventy-fifth meridian time, observations. Within each circle is also given (Chart I) the highest barometric reading and (Chart II) the lowest pressure at or near the center at that time.

Chart III.—Total precipitation. The scale of shades showing the depth of rainfall is given on the chart itself. For isolated stations the rainfall is given in inches and tenths, when appreciable; otherwise, a "trace" is indicated by a capital T, and no rain at all, by 0.0.

Chart IV.—Sea-level pressure, temperature, and resultant surface winds. The wind directions on this Chart are the computed resultants of observations at 8 a. m. and 8 p. m., daily; the resultant duration is shown by figures attached to each arrow. The temperatures are the means of daily maxima and minima and are reduced to sea level. The pressures are the means of 8 a. m. and 8 p. m. observations, daily, and are reduced to sea level and to standard gravity. The reduction for 30 inches of the mercurial barometer, as formerly shown by the marginal figures for each degree of latitude, has already been applied.

Chart V.—Hydrographs for seven principal rivers of the United States.

Chart VI.—Surface temperatures; maximum, minimum, and mean. Lines of equal monthly mean temperature in red; lines of equal maximum temperature in black; and lines of equal minimum temperature (dotted) also in black.

Chart VII.—Percentage of sunshine. The average cloudiness at each Weather Bureau station is determined by numerous personal observations during the day. The difference between the observed cloudiness and 100, it is assumed, represents the percentage of sunshine, and the values thus obtained have been used in preparing Chart VII.

Chart VIII.—West Indian monthly isobars, isotherms, and resultant winds.

Chart IX.—Total snowfall.

TABLE I.—*Climatological data for Weather Bureau Stations, April, 1901.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.													Precipitation, in inches.			Wind.								
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Mean actual, 8 a. m. + 8 p. m. ÷ 2.	Mean reduced.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
New England.							43.5	+0.6										81	6.20	+3.0										7.4	
Eastport	76	69	74	29.90	30.08	+.19	41.4	+2.8	58	29	46	31	13	36	22	39	36	83	5.58	+2.5	15	10,299	e.	54	e.	4	8	3	19	7.2	
Portland, Me.	103	81	117	29.91	30.02	+.10	43.0	0.0	71	29	48	33	14	38	29	39	35	80	7.47	+4.4	18	8,207	ne.	50	ne.	7	9	1	20	7.2	0.1
Northfield	876	15	65	29.08	30.03	+.07	44.4	+5.1	79	29	54	22	12	35	44	40	35	72	3.12	+0.9	14	6,076	n.	34	s.	18	8	4	18	6.8	3.0
Boston	125	115	181	29.85	30.00	+.08	43.5	-1.6	75	29	48	33	1	39	33	40	36	80	7.43	+4.0	16	8,870	ne.	40	ne.	3	6	2	22	7.9	
Nantucket	12	43	85	29.93	29.94	-.01	42.8	-0.3	63	29	47	34	1	39	25	41	39	90	3.71	+0.1	17	13,696	ne.	54	ne.	15	3	3	24	8.6	
Block Island	26	11	70	29.92	29.95	.00	42.4	-1.0	59	29	47	33	1	38	22	40	37	86	6.53	+3.1	16	14,730	ne.	63	ne.	16	5	5	20	7.5	
Narragansett	.....	10	.....	.....	.....	.....	43.8	-0.4	65	29	50	32	*	38	29	.....	.....	.....	6.73	+3.1	15	.....	ne.	.....	.....	.....	7	2	21	.....	
New Haven	106	117	140	29.83	29.95	-.01	46.5	+0.4	69	29	53	35	1	40	28	42	38	77	9.03	+5.5	13	9,610	ne.	45	ne.	15	9	4	17	6.4	
Mid. Atlan. States.							49.3	-1.4										68	5.08	+1.8										6.6	
Albany	97	84	113	29.89	30.00	+.05	49.5	+3.5	84	29	58	31	2	41	37	44	38	70	4.66	+2.2	16	6,215	n.	29	n.	11	8	1	21	7.0	T.
Binghamton	875	79	90	.....	.....	.....	45.9	+0.4	80	29	54	27	12	38	38	.....	.....	.....	4.20	+1.9	14	5,245	ne.	25	ne.	3	7	3	20	6.9	6.2
New York	314	108	350	29.61	29.96	-.01	49.4	+1.3	80	30	56	36	2	43	26	43	36	67	6.82	+3.4	14	12,458	ne.	52	nw.	1	6	3	21	7.3	
Harrisburg	374	94	104	.....	.....	.....	50.1	0.0	86	30	57	33	3	43	32	.....	.....	.....	2.88	-0.6	10	7,064	nw.	30	nw.	8	9	3	18	6.7	0.6
Philadelphia	117	168	184	29.83	29.95	-.03	50.1	-0.4	82	30	57	38	1	43	31	43	37	66	4.77	+1.8	12	10,180	ne.	39	nw.	9	8	1	21	7.2	
Scranton	805	111	119	29.11	29.99	+.03	47.4	.....	82	29	56	32	2	39	38	42	35	66	3.44	.....	13	6,413	ne.	29	ne.	3	7	3	20	7.2	0.8
Atlantic City	52	68	76	29.88	29.94	-.01	45.6	-1.2	57	30	50	35	1	41	21	43	40	82	3.46	+0.2	13	10,483	ne.	44	ne.	15	6	9	15	6.9	
Cape May	17	47	51	29.94	29.96	.00	46.2	-2.0	58	16	51	36	28	41	19	42	.....	.....	5.42	+2.3	12	8,018	ne.	38	e.	3	7	10	13	6.2	
Baltimore	123	68	82	29.81	29.94	-.04	50.7	-2.4	86	30	58	37	1	44	34	44	38	65	5.53	+2.1	14	5,387	n.	24	ne.	3	8	4	18	6.5	
Washington	112	59	76	29.84	29.96	-.01	50.6	-2.4	87	30	59	36	1	42	42	45	38	66	6.34	+3.0	13	7,483	nw.	36	nw.	9	12	2	16	5.8	
Cape Henry	.....	5	33	.....	.....	.....	49.6	-5.0	66	30	55	35	13	44	27	.....	.....	.....	6.51	+2.0	16	11,797	nw.	44	n.	10	6	9	15	7.0	
Lynchburg	681	83	88	29.22	29.96	-.02	51.9	-4.0	87	30	62	34	23	42	43	44	36	61	5.98	+2.6	10	5,062	nw.	30	w.	9	12	5	13	5.3	
Norfolk	91	102	111	29.85	29.95	-.03	52.0	-4.2	79	30	58	41	2	46	37	46	40	72	4.40	+0.3	10	8,630	nw.	45	se.	3	9	7	14	6.1	
Richmond	144	82	90	.....	.....	.....	52.8	.....	83	30	62	38	1	44	30	.....	.....	.....	5.29	.....	14	5,042	n.	30	sw.	3	9	6	15	5.9	
S. Atlantic States.							56.2	-5.8										66	3.61	+0.1										4.7	
Charlotte	773	68	76	29.14	29.97	-.01	53.6	-6.1	83	30	63	32	21	44	29	45	37	59	7.25	+3.7	9	6,129	nw.	32	nw.	3	13	5	12	5.1	T.
Hatteras	11	17	36	29.93	29.94	-.03	52.4	-4.8	64	6	57	42	29	48	18	49	46	79	4.16	-0.6	7	13,502	n.	48	s.	3	6	14	10	5.7	
Kittyhawk	8	12	30	.....	.....	.....	51.0	-4.8	69	6	56	42	*	46	18	.....	.....	.....	4.58	+0.1	8	12,165	nw.	.....	.....	.....	11	6	13	5.5	
Raleigh	376	93	101	29.58	29.98	.00	53.4	-5.4	82	30	64	35	21	43	33	46	38	61	5.55	+2.3	9	6,105	nw.	26	nw.	9	13	8	9	5.0	
Wilmington	78	82	90	29.88	29.97	-.01	55.9	-5.6	75	30	65	39	21	47	28	50	44	69	2.00	-1.0	6	7,852	w.	36	s.	2	14	9	7	4.4	
Charleston	48	14	92	29.95	30.00	.00	59.2	-5.4	74	25	67	41	21	52	22	51	45	65	1.64	-1.9	6	8,655	nw.	50	se.	19	14	11	5	4.2	
Columbia	.....	5	.....	.....	.....	.....	56.2	-7.4	83	30	66	37	21	47	34	.....	.....	.....	4.04	+1.3	11	.....	nw.	.....	.....	.....	14	4	12	5.3	
Augusta	180	89	103	29.79	29.98	+.01	56.4	-7.8	83	30	67	38	22	46	37	49	41	61	3.86	+0.5	8	5,902	nw.	28	w.	3	17	4	9	4.3	
Savannah	65	79	89	29.91	29.98	-.04	60.6	-5.5	78	30	69	44	4	52	25	52	47	66	1.91	-1.6	6	6,767	w.	36	sw.	2	15	7	8	3.9	
Jacksonville	43	69	84	29.95	30.00	.00	63.2	-5.7	85	2	73	45	21	54	28	54	49	64	1.08	-1.8	4	7,305	w.	42	se.	19	19	5	6	3.3	
Florida Peninsula.							69.1	-3.9										68	1.41	-0.5										3.3	
Jupiter	28	13	55	29.96	29.99	.00	69.0	-3.0	84	6	77	51	21	61	25	62	57	68	2.13	-0.3	5	8,452	w.	40	se.	19	15	12	3	3.8	
Key West	22	43	50	29.99	30.01	+.02	71.8	-4.3	82	2	75	64	21	68	10	64	60	70	0.46	-0.8	2	8,767	nw.	35	nw.	19	19	9	2	3.2	
Tampa	34	60	67	29.96	30.00	-.01	66.6	-4.5	84	1	75	50	21	58	27	58	53	67	1.63	-0.3	5	5,919	w.	37	se.	13	19	9	2	2.9	
East Gulf States.							61.5	-4.9										64	5.80	+1.4										4.5	
Atlanta	1,174	139	156	28.76	30.01	.00	54.8	-6.8	85	30	63	36	4	46	28	47	41	66	5.27	+1.6	11	9,448	nw.	56	nw.	19	11	5	14	6.3	
Macon	370	93	99	.....	.....	.....	57.6	.....	85	30	68	40	4	47	38	.....	.....	.....	3.86	.....	7	6,075	nw.	38	nw.	20	15	2	13	5.0	
Pensacola	56	78	90	.....	.....	.....	63.2	-4.5	84	30	71	45	19	55	24	.....	.....	.....	7.45	+4.0	6	8,004	nw.	36	se.	12	21	3	6	3.6	
Mobile	57	88	96	29.96	30.02	+.03	63.2	-3.7	85	30	73	43	3	53	28	54	48	66	7.79	+3.1	8	6,066	nw.	35	n.	18	16	9	5	4.4	
Montgomery	223	100	112	29.77	30.01	.00	60.4	-5.0	86	30	70	41	22	50	33	51	43	60	6.05	+1.2	6	5,912	nw.	35	nw.	19	12	11	7	4.7	
Meridian	375	84	93	.....	.....	.....	59.1	-6.5	87	30	71	38	4	47	36	.....	.....	.....	4.97	+0.2	9	4,751	ne.	27	w.	5	13	9	8	4.4	
Vicksburg	247	65	76	29.75	30.02	+.04	62.2	-3.6	88	30	72	40	3	52	31	52	44	60	2.70	-3.2	7	6,028	e.	36	nw.	17	15	9	6	4.1	
New Orleans	51	88	121	29.96	30.02	+.05	66.1	-2.9	86	30	75	47	19	58	22	57	52	67	7.79	+2.6	3	6,766	nw.	44	s.	17	19	6	5	3.3	
Port Eads	.....	27	.....	.....	.....	.....	63.2	-6.2	77	*	71	46	19	56	21	.....	.....	.....	4.43	+1.4	6	.....	se.	.....	.....	.....	7	18	5	.....	
West Gulf States.							63.8	-3.3										69	2.94	-0.9										4.6	
Shreveport	249	77	84	29.77	30.03	+.08	62.2	-4.2	88	30	73	37	3	51	32	53	47	64	3.41	-1.8	5	5,663	e.	34	sw.	5	15	5	10	4.5	
Fort Smith	457	79	94	29.53	30.03	+.11	59.0	-3.2	88	30	69	33	3	49	31	53	49	76	3.35	-1.7	9	7,866	e.	52	sw.	5	10	12	8	5.0	
Little Rock	357	93	100	29.66	30.05	+.09	59.3	-3.9	91	30	69	37	1	49	33	52	47	69	4.96	+0.2	7	6,158	nw.	40	sw.	5	15	8	7	4.1	
Corpus Christi	18	42	50	29.98	30.00	+.06	69.2	-2.1	90	17	75	52	19	64	26	63	60	76	0.45	-1.1	6	10,857	se.	36	nw.	18	12	10	8	4.4	
Fort Worth	670	106	114	29.29	30.00	+.06	62.6	.....	91	24	75	36	18	50	43	51	43	57	2.04	.....	5	9,139	s.	48	nw.	5	16	7	7	4.3	
Galveston	54	106	112	29.95	30.00	+.05	66.2	-3.4	85	30	71	44	18	62	23	61	58	78	2.86	0.0	4	9,585	se.	44	nw.	18	15	6	9	4.5	
Palestine	510	73	79	29.48	30.03	+.08	62.8	-3.9	86	24	74	39	3	52	36	56	52	72	4.97	+0.4	4	5,841	s.	36	nw.	5	14	8	8	4.6	
San Antonio	701	67	77	29.25	29.99	+.06	67.8	-2.3	90	23	80	42	19	55	39	57	48	60	0.59	-2.4	6	6,700	se.	40	nw.	5	10	12	8	5.1	
Ohio Val. & Tenn.							51.3	-4.7										69	4.21	+0.2										6.0	
Chattanooga	762	106	112	29.22	30.04	+.05	54.4	-6.5	87	30	63	38	20	46	36	46	38	60	5.36	+0.8	10	6,588	nw.	55	s.	18	11	7	12	5.8	T.
Knoxville	1,004	10	88	28.95	30.03	+.03	51.4	-6.8	85	30	60	31	20	42	36	45	39	70	5.35	+0.4	13	6,077	ne.	39	s.	5	12	3	15	5.7	4.4
Memphis	397	140	154	29.63	30.06	+.10	59.0	-3.1	90	30	68	38	1	50	28	51	45	64	1.60	-3.9	8	8,193	ne.	52	sw.	5	11	10	9	5.0	
Nashville	546	128	134	29.47	30.06	+.10	53.7	-6.1	86	30	62	35	21	45	32	46	39	62	4.99	+0.2	12	6,117	nw.	40	s.	5	9	6	15	5.9	
Lexington	989	75	102	.....	.....	.....	49.0	-5.5	84	30	57	30	21	41	29	.....	.....	.....	4.52	+0.8	11	8,415	ne.	42	nw.	20	10	5	15	6.1	4.0
Louisville	525	114	136	29.48	30.06	+.08	51.7	-4.7	87	30	60	33	1	43	33	45	38	68	2.49	-2.0	11	6,629	n.	36	sw.	5	9	4	17	6.6	T.
Evansville	434	72	82	.....	.....	.....	52.6	.....	82	29	61	32	21	44	27	.....	.....	.....	2.99	.....	12	5,829	n.	31	sw.	17	16	3	11	4.7	
Indianapolis	822	154	164	29.17	30.06	+.09	49.2	-3.7	85	30	58	30	1	41	28	44	40	74	3.19	-0.5	11	7,295	nw.	32	nw.	20	6	10	14	6.5	1.9
Cincinnati	628	152	157	29.37	30.06	+.08	49.9	-4.7	85	30	59	30	21	41	33	43	37	66	1.93	-1.3	10	6,388	nw.	36	n.	20	9	5	16	6.4	1.5
Columbus	824	87	100	29.16	30.05	+.08	48.5	-2.7	85	30	57	30	1	40	36	42	37	70	2.21	-1.0	16	6,545	nw.	29	e.	5	9	5	16	6.2	2.0
Pittsburg	842	116	123	29.09	30.01	+.02	49.1	-2.1	83	30	58	31	1	40	34	42	36	67	8.11	+5.3	14	4,523	nw.	20	se.	2	10	7	13	6.0	13.5
Parkersburg	638	77	84	29.36	30.06	+.08	48.3	-5.5	84	30	57	29	1	40	34	44	40	75	6.52	+3.1	15	5,028	nw.	30	nw.	3	10	7	13	5.8	8.2
Elkins	1,940	41	50	27.93	30.02	+.04	43.6	.....	80	30	54	21	1	33	47	39	34	78	5.61	.....	16	3,552	nw.	27	s.	18	7	6	17	6.9	11.6
Lower Lake Region.							45.5	+0.8										72	2.96	+0.6										6.0	
Buffalo	767	178	206	29.20	30.04	+.07	45.8	+4.1	74	28	54	30	19	38	30	40	34	69	3.13	+0.6	12	9,122	n.	39	s.	18	7	10	13	6.7	10.4
Oswego	335	76	87	29.65	30.03	+.04	43.9	+1.6	68	30	51	30	12	37	27	40	36	75	4.95	+2.9	15	7,339	ne.	30	ne.	20	8	3	19	6.8	7.8
Rochester	523	81	90	29.46	30.04	+.06	46.1	+2.6	78	29	54	30	2	38	30	41	36	74	4.06	+1.6	16	6,156	ne.	30	ne.	20	10	6	14	5.7	23.8
Erie	713	92	102	29.26	30.05	+.08	43.6	-0.5	76	30	50	30	19	37	32	40	37	80	3.20	+0.7	14	6,209	ne.	34	ne.	20	10	5	15	6.3	19.3
Cleveland	762	190	201	29.22	30.06	+.07	44.4	-1.3	78	30	50	32	20	38	29	40	34	71	2.10	-0.2	12	10,424	n.	60	n.	20	11	4	15	5.5	4.9
Sandusky	629	62	70	29.37	30.07	+.08	45.7	-1.3	82	30	52	32	20	40	26	41	37	71	1.84	-0.6	14	6,739	ne.	39	n.	20	9	4	17	6.2	T.
Toledo	628	123	127	29.39	30.08	+.11	47.1	-0.4	84	30	55	29	1	39	29	41	36	70	2.37	+0.2	11	7,647	ne.	37	n.	20	11	8	11	5.2	1.7
Detroit	730	160	190	29.28	30.08	+.10	47.7	+2.0	83	30	55	29	1	40	28	41	34	66	2.07	-0.2	9	8,855	n.	52	ne.	20	10	7	13	5.6	T.
Upper Lake Region.							43.5	+3.5										71	0.93	-1.4										5.2	
Alpena	609	63	80	29.48	30.15	+.15	42.5	+5.3	65	25	50	23	19	35	25	38	34	74	1.51	-0.6	6	7,464	n.	31	ne.	3	9	3	18	6.4	3.8
Escanaba	612	43	57	29.50	30.18	+.20	41.0	+5.2	65	29	50	19	1	32	25	36	30	68	0.90	-1.2	4	5,420	n.	33	n.	21	12	6	12	5.3	0.5
Grand Haven	632	55	92	29.41	30.10	+.13	45.8	+2.2	74	28	55	26	19	37	28	40	35	68	0.65	-1.9	7	7,892	nw.	33	nw.	8	12	6	12	5.4	1.0
Houghton	668	66	74	.....	.....	.....	42.6	.....	88	27	53	20	1	32	38	.....	.....	.....	1.01	.....	6	4,655	e.	24	nw.	17	17	5	8	4.2	0.4
Marquette	734	79	116	29.37	30.18	+.18	42.2	+5.0	80	26	49	27	20	35	40	37	32	72	1.14	-0.9	5	6,367	nw.	38	sw.	27	12	8	10	5.0	0.1
Port Huron	638	70	120	29.40	30.11	+.13	43.2	+1.5	80	29	51	29	12	35	36	38	33	75	1.78	-0.4	8	9,240	n.	33	ne.	20	14	4	12	5.0	0.9
Sault Ste. Marie	614	40	61	29.47	30.15	+.15	42.8	+5.1	75	27	53	22	2	32	38	38	32	75	0.82	-0.8	5	5,678	w.	33	ne.	21	13	8	9	4.7	0.3
Chicago	823	241	274	29.22	30.12	+.15	45.0	-0.6	83	30	50	30	18	40	21	41	37	77	0.33	-2.8	10	13,283	ne.	56	ne.	21	13	10	7	4.5	T.
Milwaukee	681	124	142	29.40	30.14	+.16	46.4	+3.7	83	30	53	30	18	40	26	41	36	71	0.47	-2.4	5	8,903	ne.	45	ne.	21	10	7	13	5.4	0.2
Green Bay	617	49	57	29.48	30.16	+.17	45.7	+4.7	84	29	55	26	3	36	34	39	33	64	0.51	-1.7	5	5,144	n.	30	s.	30	10	7	13	5.9	0.2
Duluth	702	95	115	29.39	30.17	+.17	40.8	+2.9	78	27	47	24	17	35	24	36	31	74	1.23	-1.2	6	5,936	ne.	36	nw.	16	11	9	10	5.5	T.
North Dakota.							45.0	+4.0										73	1.03	-0.9										5.6	
Moorhead	935	54	60	29.09	30.12	+.14	46.6	+5.3	84	26	57	24	17	36	35	41	38	80	2.28	0.0	10	8,390	se.	54	se.	3	4	13	13	6.8	0.6
Bismarck	1,674	16	29	28.25	30.05	+.08	46.6	+4.5	89	30	59	13	17	35	45	40	33	65	0.36	-1.9	4	8,867	se.	46	s.	25	13	11	6	5.0	
Williston	1,875	15	31	28.01	30.02	+.05	44.8	+2.2	91	30	57	12	17	33	40	39	34	73	0.46	-0.9	5	7,533	s.	42	nw.	21	13	12	5	5.0	0.4

TABLE I.—*Climatological data for Weather Bureau Stations, April, 1901*—Continued.

Stations.	Elevation of instruments: Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Pressure, in inches: Mean actual, 8 a. m. + 8 p. m. ÷ 2.	Mean reduced.	Departure from normal.	Temperature of the air, in degrees Fahrenheit: Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches: Total.	Departure from normal.	Days with .01, or more.	Wind: Total movement, miles.	Prevailing direction.	Maximum velocity: Miles per hour.	Direction.	Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
Upper Mis. Valley.							51.4	+ 0.3										65	1.65	− 1.3										5.1	
Minneapolis	....	99	208	....	....	....	49.4	+ 2.3	86	30	60	24	18	39	34	....	....	....	1.58	− 1.2	6	6,384	ne.	38	s.	26	8	9	13	....	
St. Paul	837	114	124	29.21	30.12	+ .15	50.0	+ 4.8	87	30	60	26	18	40	34	42	34	61	1.14	− 1.3	5	5,185	se.	30	se.	26	9	13	8	5.5	T.
La Crosse	714	70	78	....	....	....	51.5	+ 4.1	86	29	61	28	19	42	30	....	....	....	1.17	− 1.1	4	4,891	n.	24	nw.	17	10	13	7	5.0	T.
Davenport	606	71	79	29.43	30.09	+ .12	50.5	+ 0.8	87	29	60	29	1	41	32	43	36	63	0.88	− 1.9	7	5,651	ne.	29	e.	2	14	7	9	5.0	T.
Des Moines	861	84	88	29.18	30.12	+ .17	50.4	− 0.1	84	29	61	28	3	40	31	44	39	68	2.26	− 0.5	6	6,201	se.	32	sw.	30	8	13	9	5.6	5.3
Dubuque	698	101	109	29.36	30.12	+ .16	50.1	+ 1.5	86	29	60	26	1	40	30	42	34	58	1.01	− 1.8	7	5,716	e.	28	se.	27	12	13	5	4.5	T.
Keokuk	614	63	78	29.42	30.09	+ .14	51.6	− 0.4	88	29	61	30	18	42	30	46	42	73	2.29	− 0.9	8	5,503	e.	28	nw.	1	13	8	9	4.6	0.2
Cairo	356	87	93	29.68	30.07	+ .12	54.6	− 4.3	87	30	63	35	21	46	32	47	41	65	2.70	− 1.2	8	7,552	ne.	48	w.	5	7	11	12	6.1	T.
Springfield, Ill	644	82	93	29.38	30.08	+ .11	50.8	− 2.6	88	30	60	30	1	41	30	44	36	63	1.23	− 2.5	8	7,111	n.	34	s.	16	17	3	10	4.7	T.
Hannibal	534	75	110	....	....	....	52.2	− 1.5	88	29	62	29	1	43	32	....	....	....	1.55	− 1.0	9	6,540	nw.	33	nw.	5	11	10	9	4.8	T.
St. Louis	567	111	210	29.45	30.07	+ .12	54.4	− 1.8	89	30	63	33	1	46	31	48	43	69	2.35	− 1.4	9	7,661	n.	43	sw.	5	14	3	13	5.1	4.5
Missouri Valley.							51.6	+ 0.7										66	2.07	− 1.0										5.1	
Columbia	784	4	84	....	....	....	53.1	− 3.3	88	29	64	30	3	42	34	....	....	....	2.38	− 2.1	9	6,822	e.	33	nw.	6	12	5	13	5.5	1.0
Kansas City	963	78	95	29.04	30.08	+ .14	53.9	− 0.5	87	26	63	31	3	45	27	47	41	69	4.20	+ 1.3	8	6,107	e.	34	nw.	5	9	9	12	5.5	6.0
Springfield, Mo	1,324	100	103	28.63	30.04	+ .09	53.8	− 3.7	84	29	63	31	18	45	28	47	41	69	2.94	− 1.0	11	8,165	se.	45	w.	5	15	8	7	4.4	3.5
Topeka	....	81	....	....	....	....	53.4	− 3.4	88	26	64	27	3	43	29				3.55	+ 1.1	8	....	e.	....	....	....	7	14	9	5.7	6.9
Lincoln	1,189	75	84	28.77	30.05	+ .09	51.2	− 0.2	90	26	62	28	7	41	35	44	38	66	1.46	− 1.0	8	9,063	se.	60	n.	5	12	9	9	4.9	2.0
Omaha	1,105	115	121	28.87	30.06	+ .11	52.0	+ 1.0	88	26	62	30	17	42	33	45	39	66	0.89	− 2.2	7	6,750	e.	40	n.	5	9	11	10	5.3	0.6
Valentine	2,598	39	40	27.29	30.03	+ .03	48.2	+ 1.0	90	26	58	21	17	38	35	41	34	67	1.46	− 1.4	11	9,333	s.	34	se.	7	13	8	9	4.9	0.4
Sioux City	1,135	96	164	....	....	....	50.4	+ 2.4	88	26	60	22	17	41	40	....	....	....	1.50	− 1.6	7	10,776	se.	48	nw.	5	12	7	11	5.3	1.0
Pierre	1,572	43	50	28.35	30.02	+ .03	51.4	+ 5.1	94	30	63	22	6	40	39	42	32	56	1.26	− 0.7	9	8,376	se.	42	sw.	25	15	4	11	5.2	T.
Huron	1,306	56	67	28.67	30.08	+ .10	49.1	+ 4.7	93	30	61	20	17	37	38	41	35	68	0.86	− 2.1	11	11,096	se.	63	se.	3	10	16	4	4.9	1.9
Yankton	1,233	52	58	....	....	....	51.3	+ 4.6	89	26	62	27	7	40	35	....	....	....	2.25	− 0.8	10	7,618	e.	50	s.	26	10	16	4	4.5	1.3
Northern Slope.							44.9	+ 0.3										62	2.04	+ 0.4										5.2	
Havre	2,505	46	47	27.31	29.97	.00	44.2	+ 0.2	81	30	57	18	8	31	50	38	31	63	1.66	+ 0.7	5	6,681	ne.	44	ne.	26	10	17	3	4.4	8.7
Miles City	2,371	42	50	27.44	29.96	− .02	48.6	+ 2.0	90	30	61	20	5	36	40	43	39	79	0.56	− 0.5	5	5,133	se.	32	nw.	27	14	7	9	4.8	T.
Helena	4,110	88	93	25.75	29.99	− .01	43.0	− 0.5	74	30	54	18	27	32	37	34	24	53	1.58	+ 0.5	7	6,052	sw.	35	n.	14	6	10	14	6.1	8.7
Kalispell	2,965	45	51	26.88	30.01	+ .03	42.4	....	75	29	54	24	7	31	41	35	25	57	0.45	....	6	4,857	w.	29	sw.	2	15	10	5	3.9	T.
Rapid City	3,234	46	50	26.58	29.94	− .06	48.1	+ 1.5	89	30	60	23	2	37	41	40	32	61	1.86	− 0.4	7	6,012	se.	42	n.	25	7	15	8	5.7	T.
Cheyenne	6,088	56	64	23.96	30.05	+ .06	40.2	− 0.7	79	30	52	8	17	29	40	33	26	63	2.97	+ 1.6	9	7,305	nw.	36	nw.	2	13	9	8	4.8	25.6
Lander	5,372	28	36	24.59	30.03	+ .04	41.6	− 0.4	77	30	54	13	5	29	41	34	26	61	3.11	+ 0.8	8	3,815	sw.	40	sw.	26	8	12	10	5.8	28.6
North Platte	2,821	43	52	27.09	30.06	+ .11	48.6	0.0	88	26	58	24	6	39	36	42	37	55	2.53	+ 0.4	10	8,526	se.	43	se.	8	10	11	9	5.7	T.
Middle Slope.							52.0	− 2.2										64	2.93	+ 0.9										5.2	
Denver	5,291	79	151	24.68	30.04	+ .08	46.4	− 0.5	81	30	58	13	17	35	34	37	29	58	1.96	− 0.1	10	6,333	sw.	36	w.	3	10	11	9	5.0	15.4
Pueblo	4,685	80	86	25.23	29.97	− .05	48.8	− 1.7	83	30	63	17	17	34	43	38	28	57	2.05	+ 0.6	9	6,245	n.	41	nw.	4	10	15	5	4.9	2.9
Concordia	1,398	42	47	28.55	30.05	+ .09	52.0	− 3.3	87	26	62	28	*	42	38	46	41	72	3.37	+ 1.3	8	6,681	se.	39	nw.	5	11	3	16	5.8	2.9
Dodge	2,509	44	52	27.37	30.00	+ .10	52.8	− 0.9	87	26	65	24	6	41	42	45	40	73	3.45	+ 1.9	10	9,995	se.	48	nw.	5	13	7	10	5.1	4.4
Wichita	1,358	78	85	28.59	30.03	+ .10	54.4	− 3.4	90	25	64	30	3	44	34	46	40	67	5.83	+ 3.5	11	7,446	se.	52	nw.	5	11	7	12	5.1	6.5
Oklahoma	1,214	54	62	28.71	30.01	+ .09	57.9	− 3.1	89	24	69	31	17	47	41	48	39	56	1.28	− 1.6	7	9,218	se.	48	nw.	5	12	9	9	5.2	T.
Southern Slope.							58.2	− 2.2										55	2.94	+ 1.2										4.2	
Abilene	1,738	45	54	28.16	29.98	+ .05	62.5	− 2.8	87	15	75	36	18	50	40	51	42	55	0.98	− 1.7	4	8,099	se.	50	w.	4	14	7	9	4.3	
Amarillo	3,676	54	61	26.20	29.97	+ .06	53.8	− 1.5	84	25	67	26	2	41	46	43	32	55	4.90	+ 4.0	9	13,588	se.	80	nw.	4	15	7	8	4.2	1.9
Southern Plateau.							59.2	− 1.7										33	0.28	− 0.2										2.7	
El Paso	3,762	10	110	26.11	29.92	+ .03	61.2	− 2.6	89	25	77	33	18	46	44	43	21	29	0.47	+ 0.3	1	8,916	nw.	74	w.	4	17	9	4	3.3	0.3
Santa Fe	7,013	47	50	23.19	29.96	+ .04	46.6	0.0	70	25	58	17	17	35	30	35	23	45	1.02	+ 0.3	6	6,088	se.	43	se.	28	19	10	1	3.3	10.8
Flagstaff	6,907	12	25	23.26	30.05	....	42.4	....	69	24	57	13	5	28	44	36	....	....	0.22	− 0.9	6	....	sw.	....	....	...	13	8	9	...	1.6
Phoenix	1,108	47	57	28.72	29.88	+ .01	65.6	− 1.1	92	20	81	39	10	50	40	47	27	29	T.	− 0.3	0	3,738	e.	24	nw.	16	18	9	3	3.3	
Yuma	141	16	50	29.71	29.85	− .03	67.6	− 2.5	96	20	84	38	5	51	45	51	33	36	T.	− 0.1	0	4,748	w.	39	nw.	4	25	5	0	1.1	
Independence	3,910	51	58	25.90	29.86	− .07	55.2	− 2.1	81	20	68	28	4	42	34	40	19	27	T.	− 0.2	0	8,170	nw.	44	se.	30	18	12	0	2.6	
Middle Plateau.							47.1	− 2.3										47	1.00	− 0.2										4.8	
Carson City	4,720	82	92	25.22	30.03	+ .05	43.8	− 4.2	68	11	57	17	4	31	40	36	28	60	0.69	− 0.2	4	6,274	sw.	48	sw.	2	12	15	3	4.1	0.3
Winnemucca	4,344	59	70	25.62	30.04	+ .08	43.0	− 4.3	70	24	58	12	4	28	42	34	21	44	0.78	− 0.2	3	7,833	sw.	59	sw.	2	8	6	16	6.4	1.4
Modena	5,479	10	38	24.54	30.03	....	44.1	....	76	19	60	15	5	28	50	34	26	45	0.68	....	3	9,186	sw.	43	sw.	3	....	....	....	....	6.8
Salt Lake City	4,366	105	110	25.55	29.98	.00	49.6	+ 0.1	79	20	60	25	4	39	37	38	25	42	0.87	− 1.3	6	5,604	se.	37	nw.	26	17	8	5	3.5	6.7
Grand Junction	4,608	43	50	25.30	29.95	− .02	51.9	− 0.9	82	30	65	16	5	39	35	39	27	46	1.65	+ 1.0	9	4,914	se.	31	nw.	15	6	19	5	5.0	6.4
Northern Plateau.							46.2	− 2.5										60	0.87	− 0.5										5.4	
Baker City	3,471	53	58	26.42	30.05	+ .08	42.4	− 2.2	67	22	52	24	7	32	36	34	24	54	0.92	− 0.3	8	5,033	se.	32	nw.	7	7	10	13	6.1	2.6
Boise	2,739	61	68	27.14	30.02	+ .02	48.2	− 2.7	75	28	60	26	7	36	38	38	27	52	1.12	0.0	6	3,910	se.	23	se.	5	7	12	11	5.9	4.6
Lewiston	770	52	61	....	....	....	51.5	....	77	28	64	29	8	40	36	....	....	....	0.86	....	9	3,300	e.	40	nw.	5	10	10	10	5.4	0.4
Pocatello	4,482	48	56	25.42	30.00	.00	44.6	− 2.2	75	30	56	18	1	33	40	36	28	58	0.52	− 1.0	6	8,364	w.	37	s.	2	14	10	6	4.6	4.2
Spokane	1,943	99	107	27.95	30.03	+ .04	45.6	− 2.4	68	22	56	25	3	35	33	38	29	60	1.14	− 0.2	8	5,082	s.	28	sw.	1	8	11	11	5.8	T.
Walla Walla	1,000	65	73	28.95	30.03	+ .03	50.3	− 3.0	70	10	60	30	8	40	32	46	42	76	0.67	− 0.9	7	4,754	s.	27	s.	2	11	15	4	4.5	1.4
N. Pac. Coast Reg.							46.4	− 2.6										74	5.77	+ 1.3										6.1	
Neah Bay	50	7	52	29.99	30.05	+ .03	43.9	− 3.7	58	30	50	32	6	38	17	42	39	84	12.60	+ 4.1	18	4,622	sw.	30	w.	1	6	8	16	6.7	
Port Crescent	259	14	20	....	....	....	42.4	− 2.2	63	30	50	28	15	35	30	....	....	....	4.54	+ 0.5	13	3,307	w.	18	sw.	23	4	15	11	6.2	1.5
Seattle	123	114	121	29.95	30.08	+ .06	47.8	− 2.1	67	10	56	34	3	40	28	43	38	73	3.86	+ 1.0	16	4,628	se.	25	se.	4	7	17	6	5.4	
Tacoma	213	113	120	....	....	....	46.4	− 2.5	67	10	55	32	8	38	30	....	....	....	5.93	+ 2.4	15	4,730	n.	27	sw.	5	7	8	15	6.4	0.2
Astoria	20	57	64	....	....	....	46.4	− 2.3	62	30	53	34	2	40	21	....	....	....	7.84	+ 1.6	17	....	nw.	....	....	...	7	8	15	6.2	
Portland, Oreg	154	203	213	29.91	30.08	+ .03	48.8	− 2.8	70	16	57	33	3	40	30	43	37	70	4.05	+ 0.8	14	6,737	nw.	44	s.	5	4	10	16	6.6	0.2
Roseburg	518	56	67	29.50	30.08	+ .02	48.8	− 2.4	70	10	59	30	8	38	35	43	37	69	1.60	− 1.0	12	3,233	sw.	27	sw.	2	11	8	11	5.5	
Mid. Pac. C'st Reg.							52.5	− 1.9										65	2.64	+ 0.2										3.7	
Eureka	62	60	69	30.04	30.10	+ .05	47.7	− 1.9	62	16	53	34	7	42	20	44	41	79	4.08	− 0.1	9	4,437	nw.	33	ne.	2	9	13	8	4.6	
Mount Tamalpais	2,375	11	18	27.54	30.04	+ .01	50.1	....	68	19	57	32	6	44	20	41	31	55	2.03	....	6	16,436	nw.	75	nw.	25	23	2	5	2.5	
Red Bluff	332	50	56	29.64	30.00	+ .01	58.1	− 1.2	82	10	70	30	4	46	36	47	34	48	2.06	− 0.1	6	5,324	se.	36	n.	15	22	5	3	2.8	
Sacramento	69	106	117	29.92	30.00	.00	56.4	− 1.8	80	14	68	35	4	45	35	49	40	60	2.23	0.0	5	7,090	sw.	33	sw.	2	18	4	8	4.0	
San Francisco	155	161	167	29.90	30.06	+ .04	51.8	− 2.8	72	9	58	41	3	46	24	48	45	82	1.64	− 0.3	5	8,530	w.	37	w.	27	20	6	4	3.3	
Point Reyes Light	....	12	16	....	....	....	48.4	− 2.0	59	29	53	40	6	44	15	....	....	....	3.20	+ 1.5	8	17,020	nw.	60	nw.	6	12	7	11	5.0	
S. Pac. Coast Reg.							57.0	− 1.6										67	1.02	− 0.4										3.3	
Fresno	330	67	70	29.62	29.98	− .01	58.4	− 2.4	84	19	73	34	7	44	37	48	37	53	0.55	− 0.8	4	4,712	nw.	24	sw.	30	21	7	2	2.8	
Los Angeles	338	74	82	29.63	29.99	+ .01	57.0	− 1.9	73	24	67	36	8	47	30	50	46	76	0.68	− 0.7	2	3,558	w.	21	sw.	9	9	18	3	3.9	
San Diego	87	94	102	29.90	30.00	.00	57.4	− 0.9	66	29	62	46	5	53	16	52	47	70	0.01	− 0.8	1	4,360	nw.	26	w.	4	24	4	2	2.5	
San Luis Obispo	201	10	46	29.83	30.05	+ .05	55.4	− 1.4	84	19	67	35	10	44	39	48	43	70	2.83	+ 0.9	4	4,323	w.	22	w.	26	17	8	5	3.9	
West Indies.																															
Basseterre	29	41	54	29.95	29.98	....	79.4	....	86	30	85	68	11	74	16	72	69	71	1.42	....	7	5,768	e.	21	e.	21	15	15	0	3.6	
Bridgetown	30	57	65	29.92	29.95	....	78.6	....	87	29	85	68	10	72	18	72	69	72	2.05	+ 0.8	10	5,654	e.	20	se.	6	10	14	6	4.9	
Cienfuegos	52	62	67	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	...	...	...	...	....	
Grand Turk	11	6	20	....	....	....	78.0	....	89	8	84	65	12	72	20	....	....	....	0.38	....	3	....	se.	....	....	...	3	16	11	6.0	
Havana	57	87	105	29.94	30.00	....	72.2	....	88	1	78	56	5	66	23	66	62	72	0.55	− 2.3	3	8,682	n.	38	ne.	27	18	11	1	2.9	
Kingston	286	38	52	29.64	29.94	....	77.9	....	90	24	86	66	13	70	20	70	67	71	1.82	....	4	4,923	ne.	26	se.	2	9	20	1	4.5	
Port of Spain	40	65	66	29.89	29.98	....	79.8	....	91	30	89	67	12	71	22	72	68	69	0.01	....	1	3,975	e.	17	e.	7	5	14	11	6.1	
Puerto Principe	352	55	62	29.65	30.00	....	74.8	....	94	8	88	55	30	62	32	66	62	69	0.50	....	1	5,298	ne.	26	sw.	19	20	7	3	3.1	
Roseau	25	37	47	29.93	29.95	....	79.7	....	89	17	87	71	5	73	18	71	67	65	0.23	....	4	3,923	e.	17	sw.	10	22	6	2	2.6	
San Juan	82	48	90	29.89	29.97	....	78.6	....	90	30	85	70	1	72	17	72	69	73	1.11	− 2.5	9	6,562	se.	28	se.	29	20	10	0	2.8	
Santiago de Cuba	82	26	31	29.87	29.95	....	78.6	....	93	10	88	64	12	70	25	69	65	69	0.27	....	4	3,566	n.	14	n.	30	16	10	4	3.6	
Santo Domingo	57	37	41	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	...	...	...	...	....	
Willemstad	75	39	46	29.81	29.88	....	80.7	....	87	15	85	74	12	76	11	73	71	75	0.00	....	0	9,152	e.	27	e.	30	6	18	6	5.3	

NOTE.—The data at stations having no departures are not used in computing the district averages. * More than one date.

Table II.—*Climatological record of voluntary and other cooperating observers, April, 1901.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Alabama.					
Ashville	86	36	55.0	6.42	
Benton				4.06	
Bermuda	84c	34	59.6d	5.63	
Birmingham	90	36	60.8	4.94	
Bridgeport				7.00	
Burkville				4.19	
Calera				5.25	
Camp Hill	90	35	58.4	4.46	
Citronelle	87	40	62.8	6.96	
Clanton	84	38	57.5	4.12	
Daphne	86e	40e	60.9e	6.62	
Decatur	87	34	56.2	5.19	
Demopolis b				5.81	
Elba	86	36	60.4	5.88	
Eufaula a	84	38	59.2	3.68	
Eufaula c				3.45	
Eutaw	90	37	59.6	4.11	
Evergreen	85	36	60.0	6.91	
Florence a				3.95	
Florence b	89	33	56.6	3.98	
Fort Deposit	81	39	58.8	5.62	
Gadsden	91	33	55.6	6.15	
Goodwater	84	35	56.0	4.39	
Greensboro	84	38	58.7	6.28	
Greenville				6.08	
Hamilton	87	30	54.1	5.45	
Healing Springs	87	35	59.4	6.32	
Helena				4.50	
Highland Home	82	36	59.6	5.48	
Letohatchee				5.67	
Livingston a	82	37	58.3	4.55	
Lock No. 4	83	34	53.9	6.27	
Madison Station	90	34	55.5	4.83	
Maplegrove	90	34	53.4	6.18	
Marion	87	37	60.1	4.10	
Mount Willing	85	37	60.5		
Newbern	86	38	59.8	5.45	
Newburg	90	30e	56.8e	5.12	
Notasulga				5.16	
Oneonta	85	33	54.8	5.53	
Opelika	78	38	56.1	7.60	
Oxanna	84	35	57.2	6.28	
Pineapple	86	37	59.6	3.43	
Prattville	87	34	58.4		
Pushmataha	85	37	59.4	6.19	
Riverton	86	31	53.6	3.67	
Scottsboro	87	35	54.0	5.35	
Selma	86d	40	59.2	4.27	
Talladega	87	37	57.4	6.46	
Tallassee				4.88	
Thomasville	85	38	59.8	5.15	
Tuscaloosa	85	34	56.6	4.68	
Tuscumbia	84	26	52.6	4.02	
Tuskegee	85	36	60.2	3.74	
Union Springs	85	38	58.8	5.40	
Uniontown	88	38	59.9		
Valleyhead	88	32	53.4	5.08	
Verbena				5.57	
Wetumpka	85	37	59.0	4.93	
Alaska.					
Juneau	55	28	40.1	8.19	2.5
Killisnoo	45	23	36.2	1.15	1.0
Arizona.					
Allaire Ranch				0.19	
Arizona Canal Co. Dam	93	38	65.3	0.08	
Aztec *[1]	101	44	72.8	0.00	
Benson *[1]	85	42	59.7	0.00	
Bisbee	81	29	55.8	0.12	
Bowie *[5]	88	40	63.4	0.06	
Buckeye	93	34	64.7	0.00	
Casagrande *[1]	88	48	66.6	0.00	
Cochise *[5]	82	44	64.1	0.10	
Congress	86	38	63.0	0.00	
Dragoon Summit *[1]	82	34	56.1	0.52	
Dudleyville	94	28	60.9	0.33	
Fort Defiance	77	15	46.0	0.90	9.0
Fort Grant	84	31	59.0	T.	T.
Fort Huachuca	84	30	60.2	0.30	
Fort Mohave	98	36	68.6	0.00	
Gilabend *[1]	96	47	64.9	T.	
Ingleside	94	35	65.4	0.03	
Jerome	81	29	57.0	0.30	T.
Maricopa *[1]	102	34	67.6	0.00	
Mesa	93	33	62.7	T	
Mohawk Summit *[1]	104	52	71.6	T	
Mount Huachuca	84	26	57.8	0.09	
Natural Bridge				0.30	1.0
Nogales	88	30	60.0	0.14	
Oracle	85	32	57.9	0.40	2.0
Oro				0.13	
Pantano *[5]	88	41	64.4	0.20	
Parker	101	33	68.6	0.00	
Peoria	96	36	65.4	0.00	
Phoenix	95	31	63.8	T.	
Pima	90	26	58.6	0.30	
Pinal Ranch				0.74	2.5
Arizona—Cont'd.					
Prescott	78	15	48.7	0.03	T.
San Carlos	94	26	58.8	0.11	
Sentinel *[1]	96	49	70.4	0.00	
Showlow				0.60	6.0
Signal	98	28	63.2	0.00	
Silverking				0.60	
Strawberry	77	11	46.8	0.77	4.5
Supai	96	35	63.6	0.00	
Tombstone	86	28	59.6	0.24	
Tonto	91	31	59.8	0.25	
Tucson	92	28	61.7	0.04	
Vail *[5]	87	44	64.2	0.07	
Walnut Grove				0.00	
Yarnell				T.	T.
Arkansas.					
Amity	91	34	59.0	5.35	
Arkadelphia	93	33	59.9	5.48	
Batesville	94	35	58.1	3.86	
Beebranch	92	34	56.2	3.45	
Blanchard Springs	89	28	59.4	3.21	
Brinkley	87	35	57.3	3.66	
Camden a				3.94	
Camden b	87	35	60.5	3.73	
Conway	93	36	58.8	3.12	
Corning	91	38	56.9	3.50	T.
Dallas	90	33f	60.5c	3.78	
Dardanelle				3.28	
Dutton	85	29	55.5	4.01	
Elon	90	30	59.6	2.32	
Fayetteville	86	28	55.4	4.23	
Forrest City	89	37	58.0	3.26	
Fulton				4.09	
Hardy	89	33	57.0	3.48	
Helena a				2.28	
Helena b	86	38	57.8	2.33	
Hot Springs b				3.87	
Ione	88	32	60.3	4.61	
Jonesboro	96	38	61.4	3.20	
Keesees Ferry	90	30	56.2	4.22	0.2
Lacrosse	90	32	57.1	3.35	
Lonoke	91	35	59.2	4.80	
Lutherville	89	32	56.2	3.60	
Malvern		30		4.24	
Marianna	89	37	58.6	2.61	
Marvell	87	37	59.1	3.16	
Mossville	85	29	53.6	4.59	T.
Mount Nebo	86	30	58.2	3.66	
New Gascony	89	36	59.0	3.60	
Newport a				1.90	T.
Newport b	91	30	57.7	2.03	
Newport c	90	35	57.1	2.39	
Oregon	89	29	54.8	3.98	T.
Osceola	90	36	58.1	2.19	
Ozark	90	34	60.4	4.26	
Pinebluff	90	35	58.8	3.99	
Pocahontas	90	32	53.7	3.35	
Pond	87	22	53.8	3.27	T.
Prescott	89	30	59.4	4.49	
Rison	95	30	60.3	4.43	
Rosadale	92	29	60.8	4.22	
Russellville	87	33	57.6	1.85	
Silversprings	87	29	55.3	3.51	T.
Spielerville	90	33	58.8	4.79	
Stuttgart	88	36	58.4	2.85	
Texarkana	89	30	60.5	3.11	
Warren	89	32	58.4	4.06	
Washington	90	31	60.2	4.42	
Wiggs	92	29	57.8	4.91	
Winchester	90	34	57.1	2.50	
Winslow	82	28	53.5	5.15	
Witts Springs	92	26	59.1	2.93	T.
California.					
Angiola	86	28	58.5	1.10	
Bakersfield	87	30	59.4	0.30	
Ballast Point L. H.				0.18	
Bear Valley				7.56	27.0
Bellevue				0.29	
Berkeley	70	37	53.2	3.06	
Bishop	83	21	53.0	0.50	
Boca *[1]	65	19	42.0	2.04	10.0
Bodie	55	0	29.8	1.74	17.0
Bowman	70	10	44.7	5.99	37.0
Branscomb				6.56	1.8
Caliente *[1]	77	34	53.0	1.33	
Campbell	78	30	52.3	2.63	
Cape Mendocino L. H.				3.50	
Cedarville	69	15	43.0	1.44	12.0
Chico *[1]	83	38	59.6	2.70	
Cisco *[1]	53	8	34.6	4.40	44.0
Claremont	80	30	54.3	0.55	
Corning *[5]	85	38	64.0	1.50	
Crescent City	68	32	47.2	6.31	
Crescent City L. H.				6.14	
Cuyamaca *[5]	68	22	44.7	1.24	1.0
Delano *[1]	85	50	66.8	0.86	
Delta *[1]	82	32	57.3	6.81	
California—Cont'd.					
Dunnigan *[1]	82	38	60.6	2.03	
Durham *[5]	80	28	56.8	3.92	
East Brother L. H.				1.75	
Edmanton *[1]	70	19	42.0	5.62	27.0
Elmdale	85	31	56.2	1.50	
Elsinore	88	30	56.4	0.10	
Escondido	83	30	58.5	0.18	
Fallbrook	80	33	57.4	0.10	
Folsom City *[1]	86	41	58.6	3.65	
Fordyce Dam				6.05	62.0
Fort Ross	64	35	48.5	7.43	
Georgetown	73	24	50.8	6.48	0.2
Gilroy (near)	85	26	54.0	1.63	
Goshen *[5]	84	32	60.4	1.02	
Grand Island *[5]	82	36	59.2	1.97	
Grass Valley				6.04	
Greenville	74	19	44.4	4.94	6.0
Hanford	85	30	56.6	0.53	
Healdsburg	86	27	54.6	4.20	
Hollister	81	28	52.4	1.09	
Humboldt L. H.				3.35	
Idyllwild				0.37	1.6
Indio *[1]	95	51	70.5	0.00	
Iowa Hill *[1]	74	31	52.1	6.55	
Irvine	80	48	64.0	0.05	
Jackson (near)	72	24	51.9	3.82	
Jolon				2.10	
Keene				1.19	
Kennedy Gold Mine	72	24	49.4	5.01	
Kent				6.36	
Kernville				0.31	
King City				0.60	
Kono Tayee	78	35	54.2	2.05	
Laguna Valley				1.21	5.0
Lamesa				0.75	
Laporte *[1]	63	16	39.5	7.48	67.4
Las Fuentes Ranch				1.45	
Legrand	84	29	55.1	1.36	
Lemoncove	89	32	60.9	1.65	
Lick Observatory	65	24	44.8	3.33	4.0
Lime Point L. H.				1.31	
Lodi	81	32	56.0	1.46	
Los Gatos	80	35	54.2	5.59	
Mammoth *[1]	97	58	76.2	0.00	
Manzana	83	31	57.2	0.61	0.5
Mare Island L. H.				2.11	
Merced b	82	31	55.0	0.67	
Mills College				2.99	
Milo				2.45	
Milton (near)	80	32	56.9	2.60	
Modesto *[1]	85	42	61.0	0.82	
Mohave *[1]	80	35	59.2	0.00	
Mokelumne Hill *[3]		33	50.7	3.12	
Monterio	82	30	54.0	1.75	
Monterey *[5]	70	30	57.3	0.96	
Morena	79	30	51.4	0.62	
Mountainview				1.61	
Mount St. Helena				8.02	
Mutah				1.60	
Napa	85	32	55.8	2.33	
Needles	93	46	70.7	0.00	
Nevada City	72	26	48.4	5.59	
Newhall *[1]	84	40	56.3	0.74	
Niles *[1]	84	41	57.2	3.05	
North Bloomfield	77	23	49.8	6.27	T.
North Ontario	75	36	54.6	0.78	
North San Juan *[1]	69	32	47.4	4.59	
Oakland	74	38	54.8	2.62	
Ogilby *[1]	99	49	71.7	0.00	
Oleta *[1]	73	33	51.0	4.64	
Orland *[1]	88	38	53.7	1.35	
Palermo	88	29	56.4	3.68	
Palomar Mountain				0.76	0.5
Paso Robles	84	28	53.8	1.37	
Peachland *[5]	76	28	55.0	4.98	
Piedras Blancas L. H.				1.75	
Pigeon Point L. H.				1.06	
Pilot Creek				8.24	4.0
Pine Crest	73	39	55.1	2.62	
Placerville	72	26	48.6	6.54	
Point Ano Nuevo L. H.				1.90	
Point Arena L. H.				3.51	
Point Bonita L. H.				2.59	
Point Conception L. H.				2.55	
Point Fermin L. H.				0.50	
Point Hueneme L. H.				0.90	
Point Lobos	67	42	50.4	1.70	
Point Loma L. H.				0.00	
Point Montara L. H.				2.55	
Point Pinos L. H.				1.63	
Point Sur L. H.				3.01	
Pomona (near)	85	33	59.6	0.19	
Poway *[5]	75	35	58.5	0.61	
Quincy	70	23	45.1	5.44	3.5
Ranch House				T.	
Redlands	85	37	59.2	T.	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Reedly	85	38	61.9	......	
Represa	78	34	56.0	3.63	
Riovista	80	34	57.3	1.40	
Riverside	83	36	58.6	0.00	
Roe Island L. H.	......	......	......	0.78	
Rohnerville	......	......	......	3.60	
Rosewood	85	25	54.8	1.64	
Sacramento	80	33	57.5	2.76	
Salinas*[1]	70	43	54.1	1.48	
Salton*[1]	102	49	77.6	0.00	
San Bernardino	87	29	57.5	0.56	
San Jacinto	88	31	58.0	0.03	
San Jose	......	......	......	2.37	
San Leandro	72	32	53.2	2.55	
San Luis L. H	......	......	......	1.47	
San Mateo*[1]	72	42	52.7	1.88	
San Miguel*[1]	80	37	56.8	0.74	
San Miguel Island	64	41	53.3	0.98	
Santa Barbara	73	38	55.0	2.07	
Santa Barbara L. H	......	......	......	1.53	
Santa Clara	......	......	......	1.84	
Santa Cruz	79	29	51.6	2.01	
Santa Cruz L. H	......	......	......	1.99	
Santa Maria	75	33	54.7	1.82	
Santa Monica	......	......	......	0.50	
Santa Rosa*[1]	77	32	52.3	3.31	
Shasta	88	31	60.4	5.51	T.
Sierra Madre	75	38	56.7	1.50	
Snedden	......	......	......	1.40	3.0
Sonoma	......	......	......	3.26	
Stanford University	73	32	52.0	1.14	
Stockton	78	31	54.3	1.92	
Storey	84	32	56.2	0.62	
Summerdale	68	14	43.2	5.76	7.0
Susanville	70	19	46.2	1.57	2.0
Tehama*[1]	84	39	58.4	1.15	
Tejon Ranch	82	36	60.4	1.36	
Thermalito	86	32	58 0	3.62	
Trinidad L. H.	......	......	......	3.68	
Truckee*[1]	64	6	43.2	1.80	18.0
Tulare *b*	......	......	......	1.19	
Tulare *c*	86	30	57.8	1.11	
Ukiah	88	27	53.8	2.15	
Upperlake	83	29	53.3	2.43	
Upper Mattole*[1]	76	30	47.3	6.49	
Vacaville*[1]	85	38	57.9	2.43	
Ventura	69	40	54.9	0.68	
Visalia *b*	84	31	57.2	1.56	
Volcano Springs	103	59	74.2	0.00	
Wasco	87	31	59.1	1.00	
Westpoint	......	......	......	5.32	
West Saticoy	......	......	......	0.51	
Wheatland	81	32	55.8	4.00	
Williams*[5]	82	41	61.6	1.28	
Wilmington*[1]	77	45	58.4	0.31	
Wire Bridge*[5]	84	34	58.8	4.87	
Yerba Buena L. H	......	......	......	2.00	
Yreka	75	24	47.5	0.40	T.
Yuba City*[5]	86	40	62.6	3.75	
Colorado.					
Alford	78	2	38.7	2.97	38.0
Amity	85	13	51.5	......	......
Arkins	......	......	......	2.27	......
Ashcroft	......	......	......	0.99	12.5
Blaine	85	13	51.8	1.68	1.8
Boulder	79	17	47.1	3.51	26.0
Boxelder	......	......	......	2.96	21.0
Breckenridge	63	−15	28.8	3.12	44.2
Buenavista	......	......	......	0.60	7.0
Canyon	85	18	49.8	1.33	2.5
Castlerock	80	−4	43.7	3.47	36.0
Cedaredge	79	11	48.3	0.60	6.0
Cheyenne Wells	83	9	48.1	4.02	2.5
Clearview	65	−2	33.0	2.47	32.0
Collbran	79	1	45.8	2.73	16.5
Colorado Springs	76	12	43.5	2.64	24.5
Cope	84	16	46.6	1.46	6.0
Crook	86	17	47.8	2.90	0.5
Delta	84	14	51.2	0.39	T.
Dumont	......	......	......	2.79	28.0
Durango	79	0	40.6	0.55	5.5
Fort Collins	82	9	44.3	3.62	19.0
Fort Morgan	86	17	47.0	4.10	6.2
Fox	......	......	......	4.76	3.5
Gleneyrie	75	14	43.4	3.05	32.0
Greeley	84	16	46.6	2.12	6.0
Gunnison	76	0	39.7	T.	T.
Hamps	81	7	44.4	4.24	11.0
Hoehne	86	3	48.6	1.40	11.0
Holly	86	15	52.6	2.39	5.4
Holyoke (near)	86	15	47.0	3.32	1.0
Hugo	......	......	......	1.69	3.0
Husted	77	1	40.9	2.65	27.0
Lake Moraine	65	−7	33.3	3.85	49.2
Lamar	87	14	53.6	2.54	4.0
Laporte	......	......	......	4.28	......

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Colorado—Cont'd.	°	°	°	*Ins.*	*Ins.*
Las Animas	87	16	49.2	2.10	
Lay	78	5	43.1	1.48	T.
Leadville (near)	......	......	......	1.43	18.0
Leroy	83	12	45.3	2.92	7.8
Longs Peak	63	−8	32.0	1.97	25.0
Mancos	74	7	44.4	0.43	3.5
Marshall Pass	......	......	......	1.71	21.0
Meeker	74	−5	42.2	1.86	12.0
Montrose	......	......	......	0.14	
Moraine	67	−8	35.0	2.36	27.0
Pagoda	75	−6	41.8	3.05	16.0
Parachute	83	11	49.9	0.69	1.0
Perrypark	......	......	......	1.83	......
Rangely	78	6	45.2	0.58	5.0
Rockyford	86	16	51.8	2.36	1.0
Rogers Mesa	79	14	49.0	0.37	
Saguache	73	6	40.2	0.26	3.0
Salida	76	2	44.6	1.34	6.5
San Luis	75	−14	41.4	0.95	8.5
Santa Clara	71	2	40.8	4.17	51.0
Sapinero	......	......	......	0.29	2.0
Seibert	......	......	......	3.32	2.0
Silt	76	8	49.3	0.64	2.0
Sugarloaf	71	2	37.6	5.60	58.0
Telluride	71	−5	35.6	2.27	28.5
Trinidad	80	6	50.0	2.13	14.0
T. S. Ranch	78	15	48.4	0.81	1.0
Twinlakes	......	......	......	0.90	11.8
Vilas	......	......	......	2.77	
Wagon Wheel	63	−1	35.2	0.57	8.5
Walden	71	−9	35.1	1.77	22.5
Wallet	......	......	......	4.72	9.0
Westcliffe	68	−4	36.8	2.07	26.0
Wray	88	11	48.8	4.02	1.1
Yuma	......	......	......	3.90	13.0
Connecticut.					
Bridgeport	78	34	47.6	9.41	
Canton	83	27	45.9	12.30	
Colchester	80	29	46.2	9.63	
Falls Village	......	......	......	6.45	
Hartford *b*	80	32	47.2	10.90	
Hawleyville	81	30	46.5	10.25	
Lake Konomoc	......	......	......	10.50	
Middletown	82	29	47.3	13.37	
New London	70	34	46 0	5.22	
North Grosvenor Dale	87	24	44.7	7.23	
Norwalk	80	28	47.4	8.60	
Southington	78	29	47.0	9.65	
South Manchester	......	......	......	10.01	
Storrs	81	31	45.5	9.51	
Voluntown	79	25	45.0	9.61	
Waterbury	85	29	48.0	11.51	
West Cornwall	82	25	42.9	6.83	1.3
West Simsbury	......	......	......	11.10	
Delaware.					
Milford	81	33	51.6	3.87	
Millsboro	73	31	48.3	5.69	
Newark	81	35	49.0	5.84	
Seaford	81	36	50.7	4.41	
Wyoming	......	......	......	5.81	
District of Columbia.					
Distributing Reservoir*[5]	85	40	52.0	5.51	
Receiving Reservoir*[5]	83	39	51.3	6.36	
West Washington	86	32	50.9	6.37	
Florida.					
Archer	88	43	65.0	2.80	
Bartow	89	43	66.4	2.33	
Brooksville	86	46	65.1	1.36	
Carrabelle	78[b]	43[a]	63.0[c]	5.51	
Clermont	92	47	67.6	2.20	
De Funiak Springs	87	36	62.8	5.16	
Deland	88	35	62.5		
Earnestville	91	43	67.6	1.80	
Eustis	90	47	68.0	0.92	
Flamingo	90	50	70.2	2.68	
Fort George*[1]	78	50	64.8		
Fort Meade	90	44	66.8	2.05	
Fort Pierce	89	43	67.4	1.33	
Gainesville	88	41	65.3	1.60	
Huntington	88	35	63.4	1.02	
Hypoluxo	90	46	70.3	2.43	
Inverness	87	39	64.4	1.74	
Jasper	83	41	62.9	3.74	
Kissimmee	87	44	65.6	3.23	
Lake Butler	88[d]	41[c]	62.8[d]	2.05	
Lake City	84	39	63.8	1.83	
McAlpin	86[j]	39[j]	63.9[j]	2.40	
Macclenny	86	37	62.8	1.70	
Manatee	91	43	66.1	2.37	
Marco	89	53	69.4	1.50	
Marianna	83	42	62.3	2.93	
Merritt Island	86	51	68.2	2.17	
Miami	89	46	70.1	1.97	
Micanopy	89	40	65.1	1.95	
Middleburg	88	34	61.2	1.09	
Myers	87	46	68.2	1.89	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Florida—Cont'd.	°	°	°	*Ins.*	*Ins.*
New Smyrna	90	39	64.4	0.80	
Nocatee	90	44	67.2	2.50	
Ocala	89	41	64.8	1.08	
Orange City	89	38	64.1	1.05	
Orlando	88	46	66.8	2.47	
Plant City	88	38	65.0	1.37	
Quincy	85	37	61.6	2.00	
Rockwell	88	40	66.1	1.52	
St. Andrews	84	44	62.4	2.88	
St. Augustine	......	......	...	0.94	
St. Francis	90	33	62.2	0.95	
Sebastian	87[d]	46[d]	67.3[d]	1.41	
Stephensville*[1]	85	40	61.1	2.00	
Sumner	84	36	63.2	2.99	
Switzerland	81	42	62.9[e]	4.48	
Tallahassee	79	40	62.2	2.72	
Titusvi le	86	44	65.3	1.54	
Wausau	84[d]	37[d]	62.4[d]	5.02	
Wewahitchka	86	35	62.6	3.44	
Georgia.					
Adairsville	80	38	54.4	4.74	
Albany	85	41	60.8	1.30	
Allapaha	81	38	60.1	3.02	
Americus	80	39	58.1	2.57	
Athens *b*	77	37	53.4	5.59	
Auburn	86	35	54.0	5.71	
Bowersville	85	35	55.0	6.75	T.
Canton	......	......	......	6.51	
Carlton	......	......	......	4.44	
Clayton	83	32	51.6	10.61	T.
Columbus	81	41	59.0	4.07	
Covington	88	36	55.8	4.32	T.
Dahlonega	90	29	52.9	4.63	T.
Diamond	79	32	50.1	6.00	3.5
Dublin	......	......	......	3.20	
Elberton	85	38	57.4	5.79	T.
Experiment	85	37	56 4	4.36	
Fitzgerald	84	39	60.8	4.98	
Fleming	81	37	58.7	2.22	
Fort Gaines	81	42	59.6	3.85	
Gainesville	80	37	52.8	5.84	
Gillsville	82	36	55.8	6.20	
Greenbush	90	35	53.9	7.98	
Harrison	85	39	56.2	2.31	
Hawkinsville	80	42	59.2	2.60	
Hephzibah	80	40	56.2	3.10	
Jesup	83	41	61.0	2.09	
Lost Mountain	85	35	54.7	5.43	
Louisville	79	39	57.2	3.52	
Lumpkin	86	39	60.4	3.21	
Marshallville	83	40	60.2	3.28	
Mauzy	86	36	60.0	2.79	
Milledgeville	85	39	56.8	5.46	
Millen	79	38	58.9	4.27	
Morgan	85	36	58.2	3.28	
Naylor	83	35	61.2	3.20	
Newnan	79	35	54.3	2.77	
Oakdale	......	......	......	4.77	
Piscola	84	42	63.4	2.62	
Point Peter	87	35	54.0	5.12	
Poulan	82	36	59.0	4.19	
Putnam	84	39	59.2	3.48	
Quitman	84	39	60.8	3.58	
Ramsey	86	34	52.6	4.06	T.
Resaca	......	......	......	5.26	
Rome	86	37	54.4	4.98	
Statesboro	84	39	59.4	3.10	
Talbotton	85	36	56.8	3.91	
Thomasville	83	41	62.0	2.83	
Toccoa	78	37	52.8	7.97	
Valona	81	38	59.8	1.90	
Vidalia	87	40	60.2	3.51	
Washington	......	......	......	6.40	
Waycross	83	39	61.2	1.49	
Waynesboro	79	38	57.0	5.42	
Westpoint	81	38	56.4	2.86	
Woodbury	81[g]	37[g]	55.8[g]	4.96	
Idaho.					
Albion	72	18	42.7	0.56	0.5
American Falls	75	14	43.8	0.96	
Atlanta	62	3	36.4	1.34	14.5
Blackfoot	78	12	43.5	0.76	2.0
Burnside	63	14	34.8	1.20	9.5
Chesterfield	73	1	37.5	0.10	T.
Downey	75	18	44.0	0.50	5.0
Forney	75	−1	38.2	1.98	17.2
Garnet	84	24	51.0	0.34	
Hagerman	81	20	49.0	0.36	
Hailey	72	9	39.7	0.05	
Lake	64	−10	35.1	2.70	27.0
Lakeview	68	25	44.8	2.38	
Lost River	72	16	41.3	0.53	6.5
Moscow	70	26	43.4	1.87	
Murray	73	21	41.3	1.92	4.0
Oakley	70	19	39.4	0.20	
Ola	74	22	46.2	1.76	5.0

Table II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Idaho—Cont'd.	°	°	°	*Ins.*	*Ins.*
Paris	75	9	37.6	0.88	
Payette	77	24	49.0	0.66	
Pollock	78	26	47.0	1.31	
Priest River	72	22	42.6	1.83	7.0
St. Maries	74	24	45.0	2.42	.....
Soldier	71	8	38.2	0.54	5.5
Swan Valley	74	6	40.2	0.98	8.8
Weston	77	13	44.6	1.35	8.5
Illinois.					
Aledo	87	28	50.2	1.28	T.
Alexander	88	26	50.8	1.34	1.0
Ashton	87	24	47.4	0.46	0.1
Astoria	87	26	49.9	1.40	T.
Aurora *a*	87	26	47.6	0.39	1.0
Beardstown	.....	.....	.....	1.87	
Bloomington	93	26	51.1	0.94	
Bushnell	92	28	51.6	0.13	
Cambridge	87	28	49.3	1.37	2.5
Carlinville	90	25	51.4	2.56	1.0
Carlyle *	.....	.....	.....	2.78	
Centralia	93	29	52.3	1.99	
Chemung	85	23	46.1	0.47	0.5
Chester	.....	.....	.....	2.99	
Cisne	87	28	51.0	2.83	
Coatsburg	87	26	51.5	2.42	0.5
Cobden	90	30	52.8	3.74	T.
Danville	89	25	48.2	0.93	
Decatur	91	24	50.0	1.98	
Dixon	90	24	49.0	0.34	T.
Dwight	89	21	47.8	0.50	T.
Effingham	88	27	51.2	2.16	T.
Equality	88	30	53.0	3.06	T.
Flora	87	29	51.0	3.07	
Galva	88	26	49.1	0.95	0.8
Grafton	.....	.....	.....	1.44	
Greenville	91	24	52.8	2.87	
Griggsville	88	28	52.7	1.46	T.
Halfway	88	31	52.6	2.86	
Halliday	89	29	54.4	1.79	
Havana	89	23	51.8	0.89	
Henry	89	25	50.0	0.96	T.
Hillsboro	89	27	51.0	2.15	T.
Joliet	86	24	47.6	0.56	0.8
Kishwaukee	87	23	48.0	0.46	
Knoxville	87	23	47.8	1.14	0.1
Lagrange	88	25	46.9	0.47	0.2
Laharpe	88	22	50.2	1.30	T.
Lanark	88	23	47.2	0.66	T.
La Salle	89[d]	28[d]	52.0[d]	0.66	T.
Loami	.....	.....	.....	1.84	
McLeansboro	88	31	52.0	2.73	
Martinton	89	25	47.0	1.37	T.
Mascoutah	87	29	51.5	2.81	
Mattoon	84	30	50.4	2.18	0.3
Minonk	90	26	48.4	0.61	T.
Monmouth	90	23	48.9	1.23	T.
Morgan Park	.....	.....	.....	0.69	0.1
Morrisonville	90	27	50.2	2.57	
Mount Carmel	.....	.....	.....	3.34	
Mount Pulaski	90	26	50.9	1.36	T.
Mount Vernon	91[h]	30[c]	52.6[e]	2.51	
New Burnside	91	31	53.4	3.63	
Olney	87	29	50.8	2.58	
Ottawa	91	27	50.6	0.61	T.
Palestine	84	29	48.8	2.52	T.
Pana	90	28	51.0	2.19	T.
Paris	87	30	49.2	2.82	
Peoria *a*	.....	.....	.....	0.71	
Peoria *b*	90	29	51.6	0.81	
Philo	88	26	48.8	1.80	
Plumhill	88	29	50.0	2.27	
Rantoul	89	27	49.2	1.42	0.2
Raum	88	30	53.8	3.98	T.
Riley	85	25	47.6	0.26	T.
Robinson	87	27	49.8	3.16	
Roundgrove	81	23	45.6	0.49	
Rushville	87	26	51.2	1.89	0.6
St. John	92	30	53.6	2.48	
Shobonier	89	28	51.1	1.97	T.
Strawn	89	26	48.0	1.07	
Streator	77[c]	25	46.4	0.75	T.
Sullivan	86	25	48.9	2.19	T.
Sycamore	86	24	47.5	0.44	
Tilden	88	29	51.9	2.11	
Tiskilwa	87	27	49.0	0.80	T.
Tuscola	90	24	49.0	2.04	
Walnut	90	27	50.0	0.51	T.
Wellington	87	26	48.4	1.50	
Winchester	89	25	50.0	1.48	
Winnebago	88	23	48.0	0.43	T.
Yorkville	75	24	45.6	0.31	0.2
Zion	88	22	48.3	0.73	T.
Indiana.					
Anderson	84	28	47.7	2.82	2.8
Angola	82	24	46.8	2.54	3.5
Auburn	87	22	46.7	1.94	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Indiana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Bedford	86	23	50.0	2.14	
Bloomington	82	29	48.0	3.81	T.
Bluffton	87	24	47.7	2.34	1.0
Bright	83	27	46.9	2.40	T.
Butlerville	87	29	48.9	2.99	T.
Cambridge City	84	25	46.9	2.81	1.4
Columbus	90	29	49.1	3.50	T.
Connersville	85	28	47.6	2.93	2.0
Crawfordsville	90	26	49.7	2.35	
Delphi	90	22	48.0	2.21	1.0
Edwardsville *[1]	85	32	52.2	3.12	
Fairmount	86	28	48.3	2.05	1.0
Farmland	83	26	46.6	2.97	3.0
Franklin *[1]	86	35	50.8	1.76	0.5
Greencastle	83	27	48.6	2.97	0.2
Greensburg	83	28	50.0	7.12	T.
Hammond	85	26	44.4	0.69	T.
Hector	83	26	47.2	2.59	0.4
Huntington	86	29	48.2	2.58	4.0
Jeffersonville	85	32	50.8	2.61	T
Knightstown	88	28	48.2	3.56	1.5
Kokomo	.....	30	.....	2.47	0.5
Lafayette	86	25	48.7	2.07	1.0
Laporte	89	25	47.8	1.34	1.5
Logansport	83	25	46.6	3.17	T.
Madison *a*	86	30	50.0	2.52	
Madison *b*	.....	.....	.....	2.20	
Marengo	87	28	49.4	2.95	T.
Marion	86	27	48.6	2.65	2.5
Markle	86	23	47.8	2.10	3.0
Mauzy	85	24	46.8	3.09	3.5
Mount Vernon	86	30	51.4	2.79	
Northfield	85	26	47.0	2.90	1.0
Paoli	89	28	49.7	3.58	0.5
Peru	81	26	46.2	1.24	
Prairie Creek	.....	.....	.....	2.51	
Princeton	91	29	51.0	2.50	T.
Rennslaer	.....	.....	.....	1.30	
Richmond	85	25	47.4	2.37	1.0
Rockville	88	27	49.8	3.12	T.
Salem	91	27	50.4	3.13	T.
Scottsburg	87	30	50.2	2.54	T.
Seymour	85	31	50.2	4.20	0.8
Shelbyville	83	31	51.4	3.75	2.0
South Bend	86	25	47.4	1.67	2.0
Syracuse	86	20	47.0	2.34	4.5
Terre Haute	92	28	51.7	2.98	T.
Topeka	81	27	47.1	1.77	T.
Veedersburg	88	25	48.9	2.13	T.
Vevay	86	32	49.9	1.80	1.0
Vincennes	87	30	50.5	3.00	
Washington	83	28	48.0	3.24	T.
Winamac	86	22	48.8	2.04	3.0
Worthington	88	28	50.6	3.77	1.0
Indian Territory.					
Bengal	90	27	57.9	2.80	
Chickasha	90	30	59.6	1.22	T.
Claremore [f]	90	28	56.2	2.64	T.
Fairland	87	29	55.0	3.15	T.
Hartshorne	87[g]	27[g]	57.8[g]	3.29	
Healdton	91	30	59.8	3.03	
Holdenville	87	28	57.7	1.60	
Lehigh	89	30	59.9	2.26	
Marlow	90	32	60.6	3.30	
Muscogee	86	28	57.4	3.67	
Pauls Valley	94	28	58.8	2.30	
Roff	.....	.....	.....	4.05	
Ryan	95	31	61.7	2.35	
Sapulpa	93	26	59.2	3.01	T.
South McAlester	.....	.....	.....	3.31	
Tahlequah	89	26	57.4	7.90	
Tulsa	.....	.....	.....	2.77	
Wagoner	89	27	58.4	3.40	T.
Webbers Falls	88	30	59.0	4.09	
Iowa.					
Afton	85	24	49.6	3.21	6.0
Albia	87	25	49.3	2.65	4.0
Algona	85	24	49.5	2.02	4.5
Alta	86	22	48.5	1.61	1.5
Amana	87	27	50.3	1.69	
Ames *b*	87	26	49.0	1.82	
Atlantic	86	22	49.2	2.85	T
Bancroft	85	23	48.9	1.80	3.0
Battle Creek	.....	.....	.....	2.00	4.5
Baxter	86	24	49.4	1.74	
Bedford	89	21	50.1	2.83	3.0
Belknap	86	27	51.7	1.73	4.0
Belleplaine	87	25	49.2	1.90	0.5
Bonaparte	88	28	50.6	1.34	
Britt	85	22	48.1	1.84	2.5
Buckingham	.....	.....	.....	1.89	
Burlington	89	29	52.8	1.86	T.
Bussey	.....	.....	.....	2.12	1.0
Carroll	85	22	49.7	2.83	1.0
Cedar Rapids	90	28	51.2	1.17	
Chariton	84	22	49.4	2.02	4.5

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Charles City	86	23	48.6	2.36	T.
Clarinda	89	25	51.4	3.33	T.
Clearlake	88	21	50.1	1.40	1.0
Clinton	90	22	49.4	0.80	
College Springs	87	25	50.4	3.47	0.1
Columbus Junction	90	27	52.4	1.69	
Corning	83	25	48.8	2.87	3.0
Council Bluffs	91	26	52.6	0.82	
Cresco	85	23	48.0	0.99	T.
Cumberland	.....	.....	.....	2.22	.....
Danville	.....	.....	.....	2.21	
Decorah	88	20	48.2	1.22	
Delaware	86	20	48.0	1.18	1.0
Denison	86	19	48.8	3.14	
Desoto	88	25	50.6	1.84	2.0
Dows	86	20	48.0	2.09	2.0
Eldon	91	26	50.8	1.49	0.3
Elkader	90	22	50.6	0.88	T.
Emerson	.....	.....	.....	2.21	
Estherville	87	17	45.6	1.49	5.1
Fayette	87	21	47.6	1.46	1.1
Fonda	.....	.....	.....	2.81	1.5
Forest City	85	22	48.4	1.67	T.
Fort Dodge	85	20	48.1	2.88	T.
Fort Madison	.....	.....	.....	2.51	
Fruitland	92	20	51.6	1.53	
Galva	87	20	49.7	1.40	
Gilman	.....	.....	.....	1.73	T.
Glenwood	87	29	52.2	1.83	3.0
Grand Meadow	86	23	49.0	1.17	
Greene	88	23	49.5	1.66	.....
Greenfield	87	25	50.1	2.86	4.8
Grinnell	84	25	49.4	1.46	
Grinnell (near)	89	23	49.8	1.79	
Grundy Center	87	22	49.0	1.45	1.3
Guthrie Center	.....	.....	.....	2.02	T.
Hampton	88	24	50.2	2.10	1.5
Harlan	87	23	49.8	1.97	3.0
Hawkeye	.....	.....	.....	1.55	T.
Hopeville	84	27	49.8	2.33	
Hoprig	.....	.....	.....	0.75	T.
Humboldt	86	24	49.1	1.75	6.2
Independence	86	24	48.6	1.55	
Indianola	85	25	50.4	2.36	4.1
Iowa City	89	26	51.0	2.36	
Iowa Falls	85	23	48.2	1.80	2.5
Jefferson	.....	.....	.....	2.18	2.0
Keosauqua	90	28	52.6	1.95	.....
Knoxville	88	27	51.0	0.69	T.
Lacona	.....	.....	.....	2.35	
Lansing	89	22	51.4	1.04	
Larchwood	89	23	49.6	2.19	.....
Larrabee	88	20	48.9	0.85	2.5
Leclaire	.....	.....	.....	0.66	.....
Lemars	88	17	49.8	1.70	T.
Lenox	84	27	49.5	2.35	1.3
Logan	88	24	51.0	1.44	2.0
Maple Valley	.....	.....	.....	1.58	2.0
Maquoketa	87	21	50.1	1.04	
Marshalltown	89	25	50.4	1.82	
Monticello	88	15	49.6	1.24	
Mooar	.....	.....	.....	1.42	
Mountayr	84	27	49.8	2.22	4.0
Mount Pleasant	86	26	50.2	1.98	.....
Mount Vernon *b*	87	22	50.3	1.43	0.2
Murray	.....	.....	.....	1.13	0.3
New Hampton	85	24	48.6	1.13	
Newton	89	24	49.7	1.94	2.0
Northwood	85	22	50.2	1.57	T.
Odebolt	87	21	49.9	1.91	
Ogden	86	23	49.4	1.57	2.0
Olin	86	25	49.2	1.20	.....
Onawa	87	24	51.2	1.27	.....
Osage	83	24	46.8	1.87	
Oskaloosa	89	25	50.4	1.47	1.3
Ottumwa	88	30	51.0	1.29	
Ovid	85	23	49.6	2.00	4.0
Pacific Junction	87	23	51.8	0.93	0.2
Pella	88	26	51.2	.....	
Perry	85	24	50.2	1.45	
Plover	89	21	49.0	1.22	1.5
Primghar	89	.....	.....	2.00	
Redoak	88	21	51.0	2.88	1.0
Ridgeway	90	25	50.5	1.19	0.1
Rockwell City	84	25	49.2	1.75	0.5
Ruthven	88[f]	25	47.6[c]	1.48	5.5
Sac City	85	23	49.2	2.01	T.
St. Charles	86	24	50.4	2.78	3.0
Scranton	84	25	48.9	1.62	.....
Sheldon	87	20	49.2	1.56	0.5
Sibley	88[f]	21	48.5[c]	1.78	T.
Sigourney	92	26	52.3	1.58	0.5
Sioux Center	88	23	48.7	2.07	.....
Storm Lake	82	23	48.3	1.41	1.4
Stuart	88	23	51.4	3.16	4.0
Thurman	87	24	50.8	2.62	0.2

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Toledo	90	24	51.0	2.12	
Villisca	88	24	50.9	2.91	T.
Vinton*[1]	87	29	51.6	1.74	
Wapello	91[c]	29[b]	52.0[c]	1.52	
Washington	90[e]	25	50.4	1.66	
Washta	......	......	......	1.28	T.
Waterloo	88	24	49.6	1.56	T.
Waverly	88	25	50.0	1.47	1.0
Westbend*[1]	84	28	47.7	1.61	0.3
Whitten	87	21[c]	50.0	0.82	T.
Wilton Junction	87	25	50.0	1.56	
Winterset	89	25	50.4	3.13	
Woodburn	......	......	......	1.85	2.0
Kansas.					
Abilene	89	26	53.8	4.96	9.0
Achilles	93	19	48.5	3.59	8.0
Altoona	92	27	55.0	2.40	......
Anthony	......	......	......	7.25	......
Atchison *a*	88	28	52.6	5.48	7.0
Baker	86	24	51.2	3.90	6.0
Beloit	87	23	49.8	3.72	4.5
Burlington	85	24	53.6	2.13	......
Chanute	91	28	55.8	1.77	T.
Colby	91	21	48.4	2.45	0.5
Coolidge	91	17	52.4	2.15	4.0
Delphos	90	26	52.8	4.16	5.6
Dresden	93	25	48.8	2.88	3.5
Ellinwood	86	25	52.1	5.14	15.0
Emporia	81	27	54.0	4.32	6.0
Englewood	90	23	55.4	3.59	T.
Eureka	......	......	......	4.52	12.0
Eureka Ranch	90	21	51.4	3.45	6.5
Fallriver	89	25	54.6	2.42	......
Fort Leavenworth	88[d]	29[d]	54.2[d]	4.25	2.0
Fort Scott	90	29	54.0	1.43	......
Frankfort	91	25	52.8	5.80	6.0
Garden City	90	20	53.9	3.90	5.0
Gove*[1]	91	28	51.4	3.22	2.0
Grenola	90	25	54.0	4.39	1.0
Hanover	91	29	54.2	3.01	......
Harrison	90	24	51.4	1.74	.....
Hays	89	23	50.8	5.55	5.0
Horton	86	27	52.2	4.37	6.0
Hoxie	93	19	49.8	2.88	0.5
Hutchinson	87	26	52.6	3.81	5.0
Independence	91	30	55.9	3.98	T.
Jetmore	89	22[c]	52.0	3.44	6.0
Lakin	91	18	53.4	2.15	6.0
Lawrence	87	27	53.4	5.13	7.0
Lebanon	88	23	52.6	2.64	......
Lebo	86	24	53.9	3.63	10.0
Little River	86	23	53.1	4.31	15.6
Macksville	87	24	50.0	4.48	1.5
McPherson	85	26	52.4	5.62	12.8
Madison	94	22	54.4	3.60	9.0
Manhattan *c*	90	23	54.0	3.82	4.5
Marion	83[h]	29[i]	54.8[i]	3.40	9.0
Medicine Lodge	95	26	55.5	3.73	10.0
Minneapolis	85	27	52.3	4.03	5.2
Moran	85	29	53.4	1.67	8.0
Mounthope*[1]	83	31	54.0	4.20	6.0
Ness City	90	23	53.2	4.07	5.0
Newton	88	25	53.4	5.14	8.0
Norwich	88	27	54.2	3.74	1.0
Oberlin	......	......	......	3.95	3.0
Olathe	88	23	53.4	4.47	4.0
Osage City	88	25	55.0	2.65	7.5
Osborne	......	......	......	3.30	3.0
Oswego	90	29	55.4	3.30	......
Ottawa	91	26	54.5	3.79	6.0
Phillipsburg	......	20	......	3.77	3.0
Pratt	88	25	53.3	4.36	6.0
Rome	90	27	54.8	4.05	......
Salina	85	24	52.8	4.26	9.0
Sedan	88	25	53.4	3.63	T.
Seneca	89	25	52.0	2.48	4.5
Toronto	86	26	52.8	3.29	......
Tribune	87	12	47.4	1.80	6.0
Ulysses	95[g]	16[g]	54.6[g]	3.01	6.1
Valley Falls	89	25	53.0	4.05	5.0
Viroqua	92	19	54.0	2.27	5.0
Wakeeney (near)*[1]	88	28	49.4	4.69	7.1
Wallace	......	......	......	1.46	4.2
Wamego*[1]	90	23	53.4	5.50	8.5
Winfield	92	26	56.0	3.61	T.
Kentucky.					
Alpha*[2]	......	34	51.1	6.79	.....
Anchorage	84	31	50.2	2.54	6.0
Bardstown	86	31	50.2	3.01	0.5
Berea	85	30	49.0	4.89	3.5
Blandville	86	33	54.4	3.02	T.
Bowling Green	87	32	51.0	3.90	
Burnside	......	......	......	5.79	......
Catlettsburg	79	......	......	6.58	9.0
Centertown	89	29	52.3	2.74	
Earlington	91	30	54.6	2.99	
Kentucky—Cont'd.	°	°	°	*Ins.*	*Ins.*
Edmonton	88	30	51.2	5.36	4.0
Eubank	86	30	49.0	5.38	4.0
Falmouth	......	......	......	3.67	6.5
Fords Ferry	88	29	52.9	3.37	
Frankfort	83	33	52.1	2.91	......
Franklin	83	28	52.4	3.10	
Greensburg	91	28	50.2	4.30	
Henderson	85	32	52.4	3.31	
Hopkinsville	87	30	51.9	3.36	
Irvington	86	29	50.6	2.52	T.
Jackson	84	30	49.6	5.25	8.6
Leitchfield	86	32	50.3	3.57	0.2
Loretto	83	30	48.2	3.44	T.
Manchester	91	28	51.8	6.30	14.0
Marrowbone	......	30	......	4.95	1.0
Maysville	90	29	49.4	4.29	T.
Mount Sterling	83	30	47.5	5.13	......
Owensboro	87	32	51.6	3.13	
Owenton	79	30	47.4	3.06	....
Paducah *a*	......	......	......	2.77	
Paducah *b*	91	33	55.6	2.72	
Richmond	80	31	48.4	5.17	......
St. John	85	31	50.4	2.22	T.
Scott	86	30	48.8	2.34	3.0
Shelby City	87	23	48.0	5.05	5.0
Shelbyville	89	32	49.5	2.72	2.0
Warfield	84	28	49.0	6.68	16.0
Williamsburg	83	31	51.2	7.23	13.0
Louisiana.					
Abbeville	85	42	64.7	6.05	
Alexandria	93	35	63.4	2.39	
Amite	87	37	63.4	9.19	
Baton Rouge	88	40	63.6	6.31	
Burnside	88	40	63.8	9.02	
Calhoun	89	32	59.2	3.07	
Cheneyville	91	37	62.6	4.50	
Clinton	84	37	61.3	8.56	
Como	90	34	59.6	3.92	
Covington	95	37	63.8	8.29	
Donaldsonville	91	42	65.6	8.75	
Emilie	87	42	63.8	8.47	
Farmerville[e]	88	40	65.2	3.02	
Franklin	88	41	64.4	6.03	
Grand Coteau	90	41	64.4	4.59	
Hammond	90	37	63.8	8.32	
Houma	86	43[k]	65.0[f]	4.83	
Jeanerette	90	41	66.2	5.68	
Jennings	88	39	63.8	2.56	
Lafayette	92	37	60.2	3.86	
Lake Charles	90	39	64.0	4.64	
Lake Providence	90	36	62.2	3.19	
L'Argent	90	34	60.2	2.61	
Lawrence	88	46	63.6	5.93	
Libertyhill	90	30	61.7	2.70	
Mansfield	89	31	60.6	4.79	
Melville	89	39	63.4	6.20	
Minden	92	31	60.4	3.90	
Monroe	92	39	64.5	2.91	
New Iberia	87[i]	42[g]	64.2[b]	10.30	
Oakridge	91	37	62.2	4.48	
Opelousas	88	37	63.5	5.30	
Oxford	87	30	60.2	4.48	
Paincourtville	89	42	65.1	7.22	
Plain Dealing	89	28	59.8	3.90	
Prevost	......	......	......	6.35	
Rayne	90	38	65.6	3.33	
Reserve	......	......	......	8.70	
Robeline	90	32	60.7	6.80	
Ruston	90	32	60.6	4.08	
Schriever	89	39	64.0	5.26	
helibeach	......	......	......	3.80	
Southern University	84	40	60.8	8.33	
Sugar Ex. Station	85	44	64.4	8.50	
Sugartown	87	40	63.8	2.84	
Venice	80	47	63.2	2.84	
Wallace	89	41	64.5	8.35	
White Sulphur Springs	91	......	......	3.22	
Maine.					
Bar Harbor	73	25	43.0	5.81	T.
Belfast	72	28	44.2	6.49	
Bemis	75[d]	20[d]	41.8[d]	7.14	
Calais	73	27	43.8	7.85	
Carmel	77	23	45.0	4.92	
Cornish	81	30	44.4	11.52	1.0
Fairfield	78	29	45.7	3.96	
Farmington	80	25	45.2	6.88	
Flagstaff	80	15	41.4	7.83	
Gardiner	79	29	46.4	6.43	
Kineo	70	23	37.4	4.85	T.
Lewiston	83	30	45.5	8.16	1.0
Mayfield	74	25	42.7	6.33	
North Bridgton	81	26	44.4	7.60	
Orono	76	25	44.6	5.12	
Petit Menan	49	32	41.2	......	
Rumford Falls	77	25	43.2	7.91	0.5
Winslow	79	25	46.0	4.50	
Maryland.	°	°	°	*Ins.*	*Ins.*
Annapolis	75	29	50.4	7.48	
Bachmans Valley	83	30	47.0	5.93	T.
Boettcherville	88	27	49.8	5.26	5.0
Boonsboro *a*	88	28	49.2	5.16	T.
Carmichael	......	......	......	4.56	
Charlotte Hall	82	29	49.8	7.08	
Chase	73	32	47.8	5.91	
Chestertown	77	35	50.1	5.70	
Chewsville	83	27	48.8	5.73	
Clearspring	80	33	47.2	5.96	.....
Coleman	......	......	......	5.44	
Collegepark	84	31	49.9	6.40	
Cumberland *b*				4.54	
Darlington	85	35	50.2	4.83	
Deerpark	81	15	41.8	6.04	25.0
Denton	82	35	50.4	4.50	
Easton	79	35	50.2	6.13	
Fallston	84	34	49.0	5.66	T.
Frederick	86	33	50.6	5.88	
Frostburg	82	24	44.6	7.97	14.0
Grantsville	79	25	43.3	6.08	22.2
Greatfalls	82	33	48.4	5.90	
Greenspring Furnace	86	28	48.6	6.29	T.
Hagerstown	88	30	50.4	4.60	
Hancock	90	25	49.6	6.07	T.
Jewell	83	34	49.8	6.80	
Johns Hopkins Hospital	86	32	49.4	7.05	
Laurel	88	30	50.0	6.13	
McDonogh	84	32	48.6	5.18	
Mount St. Marys Coll	86	34	49.8	7.60	
Newmarket	85	32	49.7	5.47	T.
Pocomoke	77[e]	34[e]	50.6[e]	4.02	
Prince Fredericktown	83	34	50.0	6.47	
Princess Anne	77	30	49.8	4.52	
Queenstown	79	38	50.9	5.03	
Rockhall *b*	78	36	50.2	5.18	
Sharpsburg	87	34	52.6	6.02	......
Smithsburg *a*	85	26	49.0	6.44	
Smithsburg *b*	85	26	48.2	7.77	T.
Solomons	81	38	51.1	4.42	T.
Sudlersville	86	32	50.6	5.11	
Sunnyside	80	17	40.4	7.70	25.0
Takoma Park	82	34	50.1	7.05	
Taneytown	86	31	49.2	3.73	
Van Bibber	75	37	50.4	5.85	
Westernport	84	25	46.0	5.68	4.0
Westminster	84	30	48.2	3.74	
Woodstock	85	26	50.4	5.04	
Massachusetts.					
Amherst	82	29	47.6	5.80	
Bedford	80	31	44.2	6.66	
Bluehill (summit)	78	30	42.2	7.31	T.
Cambridge	79	32	44.0	8.26	
Chestnuthill	80	31	44.1	8.21	T.
Cohasset	......	......	......	8.76	
Concord	82	29	44.2	6.72	
East Templeton*[1]	80	32	42.7	2.77	2.0
Fallriver	74	33	45.6	8.98	T.
Fitchburg *a**[1]	80	34	43.9	9.91	0.5
Fitchburg *b*	85	30	44.4	8.98	T.
Framingham	82	31	45.5	8.00	
Groton	80	28	43.5	10.65	T.
Hyannis	......	......	......	5.70	
Jefferson	......	......	......	9.44	1.0
Lawrence	80	30	44.2	7.95	
Leominster	......	......	......	9.13	T.
Lowell *a*	83	31	45.5	10.57	
Lowell *b*	82	29	44.8	......	
Ludlow Center	80	22	42.2	5.93	
Middleboro	78	25	43.7	7.30	T.
Monson	83	28	46.8	6.69	
New Bedford *a*	70	34	44.8	7.08	
Pittsfield	82	26	45.0	5.97	
Plymouth*[1]	76	38	44.8	7.78	
Princeton	......	......	......	9.84	
Provincetown	68	31	43.4	5.34	
Salem	......	......	......	8.88	
Somerset*[1]	74	30	46.7	8.79	
Springfield Armory	86	31	47.3	6.80	T.
Taunton	77	26	43.2	8.05	
Webster	......	......	......	6.84	
Westboro	86	30	46.0	8.25	
Weston	77	31	44.5	7.02	T.
Williamstown	78	27	45.8	5.76	0.5
Winchendon	......	......	......	5.08	1.0
Worcester	84	32	45.6	6.81	T.
Michigan.					
Adrian	83	23	47.0	1.83	1.3
Agricultural College	83	23	46.4	2.16	0.5
Allegan	82[c]	20[c]	44.8[c]	0.40	1.0
Alma	85	22	46.2	1.78	2.0
Ann Arbor	84	26	46.8	1.63	0.6
Annpere	82	20	41.4	2.20	2.0
Arbela	82	23	46.4	3.30	2.0
Baldwin	85	12	45.0	0.30	2.0
Ball Mountain	83	26	46.0	2.01	T.

TABLE II.—*Climatological record of voluntary and other cooperating observers.*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
***Michigan*—Cont'd.**	°	°	°	*Ins.*	*Ins.*
Baraga	80	18	37.4	......	......
Battlecreek	83	23	47.2	2.25	1.5
Bay City	84	23	44.1	1.05	2.0
Benzonia	80	19	45.0	0.58	3.0
Berlin	82	25	45.5	1.74	1.5
Berrien Springs	84	22[c]	46.7[d]	1.33	1.0
Big Rapids	83	19	45.8	0.67	2.0
Birmingham	83	25	46.5	1.65	T.
Boon	80	12	42.3	0.81	3.3
Calumet	80	21	40.8	1.10	T.
Carsonville	75	23	42.4	1.61	1.0
Charlevoix	81	16	42.2	0.76	2.2
Chatham	75	3	41.0	1.64	T.
Cheboygan	75	20	43.0	0.91	2.0
Clinton	84	21	46.4	1.92	2.5
Coldwater	83	22	46.4	2.18	2.5
Deerpark	73	15	37.5	0.93	......
Detour	69	22	40.8	1.17	1.5
Dundee	83	25	46.2	2.66	T.
East Tawas	70	31	47.7	3.04	1.0
Eloise	84	20	47.2	1.74	0.5
Ewen	76	5	39.2	0.10	......
Fennville	81	24	46.4	0.76	0.8
Fitchburg	82	22	45.5	2.10	4.0
Flint	82	25	45.1	2.30	0.5
Gaylord	81	18	43.0	0.50	3.0
Gladwin	84	21	46.6	1.20	3.0
Grand Marais	74[i]	20[i]	42.0[i]	0.98	2.0
Grand Rapids	84	25	49.0	1.45	T.
Grape	84	25	46.0	2.71	1.0
Grayling	84	18	45.2	0.40	3.0
Hanover	83	24	46.4	2.31	1.5
Harbor Beach	73	25	41.6	1.38	0.2
Harrison	82	17	46.0	0.40	1.0
Harrisville	65	20	41.5	2.93	4.5
Hart	86	20	46.6	0.55	2.0
Hastings	85	19	46.4	1.96	2.5
Hayes	81	24	43.2	1.91	......
Highland Station	......	......	......	1.70	1.0
Hillsdale	82	22	45.4	1.98	2.0
Humboldt	79	3	39.2	2.55	T.
Ionia	85	23	48.4	1.60	1.0
Iron River	81	8	40.8	1.46	T.
Ishpeming	79	18	41.7	1.20	
Ivan	82	14	44.2	0.45	2.0
Jackson	86	24	47.5	1.60	1.0
Jeddo	82	26	45.0	2.12	0.5
Kalamazoo	84	28	47.4	0.45	1.8
Lake City	83	15	44.4	0.33	3.0
Lansing	82	25	46.9	2.29	2.0
Lapeer	82	23	45.6	1.52	......
Lathrop	71	8	40.0	1.27	0.2
Lincoln	74	20	45.0	1.10	2.0
Ludington	72	21	44.0	0.40	2.0
Mackinac Island	72	23	43.5	2.07	3.5
Mackinaw	71	31	48.0	1.41	
Madison	86	24	46.8	1.85	2.5
Mancelona	89	15	45.6	0.67	2.0
Manistee	80	19	44.5	0.41	3.0
Manistique	65	19	41.5	1.59	0.5
Menominee	76	21	43.2	0.95	2.0
Mio	84	13	45.0	0.91	4.5
Mount Clemens	84	27	45.8	1.24	2.0
Mount Pleasant	85	22[f]	47.5[e]	1.14	T.
Muskegon	78	20	46.8	1.05	
Newberry	73	17	45.0	0.20	2.0
North Marshall	81	22	46.3	2.15	1.0
Northport	80	23	46.0	0.60	4.0
Old Mission	83	23	45.3	0.31	1.0
Olivet	85	25	46.4	2.02	3.5
Onaway	82	18	43.6	1.08	4.0
Ovid	82	23	47.2	2.31	2.0
Owosso	84	21	47.0	2.20	1.0
Petoskey	74	21	44.2	0.72	1.0
Port Austin	82	21	42.0	1.68	......
Reed City	83	18	48.1	0.47	2.0
Roscommon	......	......	......	0.80	2.0
Saginaw	85	25	46.6	2.59	1.5
St. Ignace	74	19	42.3	1.16	1.0
St. Johns	84[c]	22[c]	47.4[c]	1.96	3.2
St. Joseph	76	24	42.8	0.20	T.
Sidnaw	80	12	38.8	0.80	T.
Somerset	81	22	45.5	2.02	T.
South Haven	74	20	44.0	0.80	T.
Stanton	84	21	46.8	1.55	3.0
Thomaston	75	0	39.6	0.51	......
Thornville	81	27	45.6	1.27	2.0
Traverse City	84	20	41.0	......	3.0
Vassar	83	21	46.1	2.26	4.0
Wasepi	82	21	46.5	2.06	2.0
Waverly	80	18	45.6	0.56	1.0
West Branch	84	19	44.8	1.05	3.5
Wetmore	74	13	38.6	0.50	2.0
Whitecloud	84	17	46.2	0.75	2.0
Whitefish Point	61	16	36.8	0.55	T.
Ypsilanti	82	24	45.8	2.05	1.0
Minnesota.	°	°	°	*Ins.*	*Ins.*
Ada	85	22	45.2	1.62	2.0
Alexandria	80	17	45.3	1.97	1.5
Ashby	81	21	47.6	3.22	T.
Beardsley	88	20	46.9	2.97	
Bemidji	78	19	44.3	......	
Bird Island	88	19	49.1	1.57	T.
Blooming Prairie	85	21	46.8	1.55	1.0
Brainerd *	80	23	46.7	2.11	
Caledonia	85	23	48.8	1.68	
Campbell	85	21	46.0	2.66	4.0
Collegeville	82	23	45.2	1.45	T.
Crookston	80	21	44.4	2.45	0.2
Deephaven	......	......	......	1.40	
Detroit City	83	17	44.8	2.95	3.0
Faribault	86	23	49.8	1.00	0.9
Farmington	85	22	49.2	1.44	
Fergus Falls	80	20	46.9	2.15	1.0
Glencoe	86	18	46.0	0.66	0.6
Grand Marais	......	......	......	1.88	......
Grand Meadow	86	19	47.6	1.93	0.8
Granite Falls	84	18	48.8	1.35	......
Hovland	......	......	......	1.87	T.
Lake Jennie	85	21	48.1	1.52	
Lakeside	84	20	48.9	1.44	T.
Lake Winnibigoshish	76	6	38.0	1.75	2.8
Leech	77	15	43.1	1.20	3.0
Long Prairie	82	15	46.2	2.22	3.0
Luverne	85	23	48.2	1.75	0.4
Lynd	88	18	49.2	1.97	3.0
Mapleplain	88	22	48.8	1.21	0.7
Milaca	83	19	46.2	0.70	
Milan	90	20	48.9	1.27	2.0
Minneapolis a	88	22	48.4	1.82	T.
Minneapolis b[1]	87*	21	48.9	1.45	T.
Montevideo	89	18	49.2	1.42	......
Morris	88	20	49.0	1.72	4.0
Mount Iron	77	10	43.4	1.35	3.5
Newfolden	76	19	37.0	2.61	
New London	85	18	46.7	1.55	T.
New Richland *[1]	82	28	48.8	......	......
New Ulm	90	20	50.4	1.76	4.0
Park Rapids	78	19	42.5	2.51	2.5
Pine River	78	15	43.9	3.34	T.
Pipestone	86	24	46.9	2.20	1.0
Pleasant Mounds	88	20	49.6	1.39	4.0
Pokegama Falls	77	10	41.2	1.94	2.8
Redwing a	......	......	......	0.85	
Redwing b	87	26	51.0	0.85	
Reeds	......	......	......	1.13	
Rolling Green	83	24	47.4	0.80	4.0
St. Charles	87	19	48.2	1.43	
St. Cloud	82	21	48.8	2.00	
St. Peter	89	20	48.8	1.32	T.
Sandy Lake Dam	76	16	42.6	1.07	2.0
Shakopee	85	23	49.2	1.15	
Thief River Falls	......	......	......	2.29	T.
Tower	77	15	42.7	1.00	4.0
Two Harbors	76	19	39.2	2.17	T.
Wabasha *[3]	......	26	47.3	1.02	
Warroad	73	11	41.2	2.04	3.0
White Bear	83[c]	23[c]	50.0[c]	0.88	
Willmar	86	23	47.4	1.93	T.
Willow River	91	15	44.2	0.68	
Winnebago City	87	20	48.0	1.73	......
Worthington	84	23	45.9	2.02	0.5
Zumbrota[1]	86*	22	49.3	......	......
Mississippi.					
Aberdeen	80	34	53.3	4.18	
Agricultural College	93	39	59.6	4.94	
Austin	95	32	59.3	2.53	
Batesville	87	35	56.6	3.68	
Bay St. Louis	86	44	64.2	8.78	
Biloxi	85	44	65.0	9.05	
Booneville	85	36	56.0	3.31	
Brookhaven	89	33	60.8	6.21	
Canton	88	36	59.8	3.36	
Cleveland	......	......	......	3.39	
Columbus b	85	37	57.8	4.32	
Corinth	84	36	55.3	3.03	
Crystalsprings	88	36	59.8	5.16	
Edwards	89	38	62.4	3.18	
Fayette	85	36	60.0	2.55	
Fayette (near) *[1]	86	41	63.2	3.38	
Greenville a	88	39	61.6	3.17	
Greenville b	89	40	60.4	3.06	
Hernando	85	38	57.3	1.28	
Holly Springs	84	35	56.6	3.44	
Indianola	89	36	61.1	2.56	
Jackson	91	38	60.2	4.33	
Kosciusko	89	38	59.5	3.60	
Lake	84	31	56.7	4.18	
Leakesville	91	36	62.6	7.34	
Louisville	89	31	58.4	4.63	
Macon	86	36	57.6	2.10	
Magnolia	89	32	62.0	7.68	
Natchez	88	35	68.0	2.95	
***Mississippi*—Cont'd.**	°	°	°	*Ins.*	*Ins.*
Nittayuma	92	39	60.8	2.94	
Okolona	89	40	60.2	2.19	
Palo Alto	89	39	59.2	3.37	
Pearlington	89	37	63.1	6.16	
Pontotoc	89	38	58.0	3.70	
Poplarville	90	39	64.0	7.20	
Port Gibson	89	34	60.4	2.48	
Ripley	91	32	56.5[c]	3.45	
Saratoga	91	30	59.0	5.10	
Shoccoe	......	......	......	3.79	
Storington *[1]	86	38	61.7	3.62	
Suffolk	......	......	......	4.54	
Thornton	88	40	62.3	3.30	
Walnutgrove	85	39	61.4	3.98	
Watervalley	90	......	......	5.00	
Waynesboro	85	37	61.1	7.20	
Windham	97	36	61.8	3.93	
Woodville	88	38	62.8	5.72	
Yazoo City	88	37	59.6	4.02	
Missouri.					
Appleton City	90	30	54.4	2.89	4.5
Arthur	87	26	54.1	1.76	T.
Avalon	86	29	52.8	2.24	1.5
Bagnell	......	......	......	3.29	
Bethany	84	25	50.4	3.06	0.5
Birchtree	89	31	54.6	3.56	3.0
Boonville	......	......	......	4.13	
Brunswick	87	30	52.8	2.04	T.
Carrollton	85	28	50.9	2.33	T.
Conception	83	27	51.4	3.16	2.0
Cook Station	90	25	52.0	3.00	T.
Cowgill *[5]	84	30	52.6	5.41	T.
Darksville	87	28	51.6	2.05	
Desoto	92	29	53.0	3.19	T.
Downing	......	......	......	1.67	2.0
Edgehill *[5]	82	32	52.3	3.59	4.0
Eightmile *[3]	......	27	49.1	2.78	8.0
Eldon	88	29	53.8	2.30	T.
Fairport	......	......	......	2.42	3.0
Fayette	88	27	53.0	2.35	3.0
Fulton	89	28	52.6	3.29	T.
Gayoso	88	35	57.4	3.37	
Glasgow	86	29	53.6	2.16	5.0
Gorin	......	......	......	1.88	T.
Halfway	86	28	53.9	4.01	1.0
Harrisonville	88	27	52.5	2.85	5.0
Hazlehurst	......	......	......	2.76	3.0
Hermann	......	......	......	2.76	......
Houston	89	28	53.6	3.22	3.0
Irena	......	......	......	2.49	
Ironton	92	28	52.6	3.92	3.0
Jackson	90	......	......	3.31	
Jefferson City	92	30	53.2	2.59	......
Kidder	84	28	51.0	4.40	2.8
Koshkonong	90	31	56.1	3.44	1.0
Lamar	91	28	55.4	1.95	T.
Lamonte	......	......	......	1.60	2.0
Lebanon	87	31	54.3	3.43	2.5
Lexington	89	29	53.7	3.85	
Liberty	87	27	52.2	3.13	4.0
Louisiana	92	26	53.6	2.15	
McCune *[1]	88	32	52.4	2.06	2.0
Macon	92	27	53.2	1.45	T.
Marblehill	90	30	54.4	3.28	T.
Marshall	86	30	53.2	3.43	3.0
Maryville	89	28	51.4	2.95	3.0
Mexico	90	31	53.4	2.22	2.0
Miami *[5]	86	30	54.4	3.21	4.2
Mineralspring	87	28	55.2	2.88	0.5
Montreal	88	28	53.4	3.00	2.0
Mountaingrove	88[c]	29[c]	55.6[c]	......	......
Mount Vernon	91	28	54.5	3.50	T.
Neosho	86	27	54.2	3.12	1.0
Nevada	......	......	......	1.82	2.0
New Haven	90	31	53.8	2.90	T.
New Madrid	......	......	......	3.39	
New Palestine	87	31	53.8	2.51	0.2
Oakfield	89	30	53.4	3.17	2.0
Olden	86	31	54.1	3.64	2.0
Oregon a	89	28	53.4	4.08	2.1
Palmyra *[5]	90	30	52.6	1.72	1.2
Phillipsburg *[1]	86	32	53.0	2.94	T.
Pine Hill	......	......	......	3.94	T.
Poplarbluff	92	33	57.6	3.59	
Potosi	88	24[c]	51.0[c]	3.78	2.0
Princeton	90	27	51.2	1.99	3.0
Richmond	87	30	52.8	4.64	3.0
Rockport	......	......	......	2.88	T.
Rolla	......	......	......	2.99	1.5
St. Charles	90	29	53.2	1.05	T.
St. Joseph	......	......	......	3.68	1.0
Sarcoxie *[3]	......	30	51.8	2.80	1.5
Sedalia	87	28	53.4	1.85	2.0
Seymour	86	30	53.6	3.20	4.5
Shelbina	......	......	......	1.90	T.
Sikeston	87	32	54.1	4.29	T.

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Missouri—Cont'd.	°	°	°	*Ins.*	*Ins.*
Steffenville	90	30	53.4	0.89	1.5
Sublett	87	25	50.9	2.57	2.0
Trenton	85	30	52.0	2.31	T.
Unionville	94	28	52.6	2.02	4.0
Vichy	90	28	53.6	2.95	T.
Warrensburg	90	29[c]	53.8	2.18	.....
Warrenton	89	27	51.4	2.99	1.5
Wheatland	.....	.....	.....	2.49	5.0
Willowsprings	88	32	54.3	4.71	2.0
Windsor	85	28	53.0	2.27	1.0
Zeitonia	88	30	53.2	3.50	2.5
Montana.					
Adel	71	−1	37.5	3.00	24.0
Augusta	71	15	39.5	0.51	T.
Billings	88	23	47.0	.....	.....
Bozeman	74	12	39.4	1.29	.....
Butte	69	11	36.5	2.35	.....
Canyon Ferry	82	20	45.0	1.33	T.
Chester	81	13	41.2	0.15	1.5
Chinook	87	10	42.2	.....	.....
Clemons	68	6	38.0	1.10	11.0
Columbia Falls	78	0	40.8	1.54	3.5
Corvallis	75	20	44.0	0.65	0.5
Crow Agency	89	18	48.4	0.67	T.
Culbertson	91[1]	14[1]	47.9[1]	0.30	
Dell[g]	70	9	40.6	.....	
Dillon	73	20	43.7	3.26	25.0
Dupuyer	76	17	41.2	1.16	11.6
Ekalaka	87	18	46.0	T.	T.
Fort Logan	76	10	40.2	1.71	.....
Glasgow	89	13	48.6	0.76	
Glendive	90	22	48.5	0.73	T.
Glenwood	75	9	39.4	1.42	
Greatfalls	75	21	44.3	0.97	2.9
Kipp	77	10	36.8	1.08	10.0
Lewistown	82	10	43.0	1.10	17.0
Livingston	80	21	44.1	0.77	0.7
Martinsdale	80	15	40.6	1.20	8.0
Marysville	70	12	37.6	1.70	15.0
Missoula	79	24	45.2	1.13	1.0
Ovando	76	10	38.7	1.34	4.6
Parrot	75	17	42.1	1.47	11.2
Plains	75	20	43.5	0.30	T.
Poplar	89	17	47.0	0.38	T.
Radersburg[c]	80	16	43.4		
Ridgelawn	92	14	44.2	0.34	
St. Pauls	80	10	43.2	3.16	26.5
Troy	78	20	43.8	1.97	T.
Twin Bridges[c]	72	15	39.0		
Utica	76[d]	8	42.0	1.65	18.0
Wibaux	86	14	43.3	0.35	T.
Yale	73	19	39.4	1.35	6.5
Nebraska.					
Agate	.....	.....	.....	1.46	5.3
Agee*[1]	90	26	48.0	1.86	.....
Albion	89	21	48.2	2.59	2.0
Alliance	86	20	46.8	1.40	2.0
Alma	90	19	51.0	2.88	2.0
Ansley	86	22	48.2	2.93	.....
Arapaho*[1]	91	29	53.8	3.20	.....
Arborville*[1]	86	22	47.5	2.46	3.0
Arcadia	.....	.....	.....	2.20	0.2
Arlington	.....	.....	.....	1.37	.....
Ashland *a*	91	26	52.0	1.62	1.0
Ashland *b**[1]	92	27	50.8	1.27	1.5
Ashton	.....	.....	.....	2.61	1.0
Auburn	91	25	52.0	2.49	2.0
Aurora	86	23	48.3	2.62	2.0
Bartley	.....	.....	.....	3.27	.....
Beatrice	91	25	51.4	2.29	1.8
Beaver	95	25	50.0	3.52	3.0
Bellevue	.....	.....	.....	1.41	2.7
Benedict	.....	.....	.....	2.23	5.0
Benkleman	.....	.....	.....	3.05	5.5
Blair	90	20	49.6	1.37	2.5
Bluehill	80	26	46.8	2.30	T.
Bradshaw	.....	.....	.....	3.17	5.0
Brokenbow*[1]	88	20	46.9	2.45	.....
Burchard	.....	.....	.....	1.15	2.0
Burwell	.....	.....	.....	2.89	1.5
Callaway	87	17	47.0	3.35	2.0
Camp Clarke	87	21	47.8	3.54	3.5
Central City	.....	.....	.....	3.10	4.0
Chester	.....	.....	.....	2.43	2.0
Cody	.....	.....	.....	1.40	.....
Columbus	87	25	49.4	1.66	.....
Crete	88[c]	23	52.4[c]	2.25	2.5
Culbertson	.....	.....	.....	2.26	.....
Curtis	91[c]	5[c]	49.0[c]	2.64	.....
David City	89	28	51.0	2.10	4.0
Dawson	91	26	53.0	1.46	0.6
Eden	.....	.....	.....	2.48	3.0
Edgar *a**[5]	85	32	52.2	1.50	0.5
Ericson	.....	.....	.....	1.64	1.5
Ewing	.....	.....	.....	1.79	1.2
Fairbury	92	24	52.0	2.08	3.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Fairfield	88	28	51.2	1.95	4.0
Fairmont	88	24	48.8	1.66	3.0
Fort Robinson	85	22	47.2	2.50	T.
Franklin	92	10	46.9	2.76	.....
Fremont	90	26	50.4	1.17	1.5
Fullerton	.....	.....	.....	2.26	4.0
Geneva	88	26	50.4	2.02	3.5
Genoa	86	27	49.6	2.64	2.5
Gering	85	18	46.8	2.31	4.6
Gordon	.....	.....	.....	1.30	.....
Gosper	.....	.....	.....	4.25	T.
Gothenburg	.....	.....	.....	4.31	.....
Grand Island *b*	87	26	50.2	3.13	3.1
Greeley	.....	.....	.....	2.05	1.5
Guide Rock	.....	.....	.....	1.87	T.
Haigler	.....	.....	.....	3.55	0.5
Hartington	89	24	48.6	1.95	1.5
Harvard	86	24	49.0	1.85	3.0
Hastings*[1]	84	30	50.8	3.47	4.0
Hayes Center	.....	.....	.....	3.04	2.0
Hay Springs	87	21	46.7	2.90	10.0
Hebron	89	24	51.4	1.70	.....
Hickman	.....	.....	.....	1.50	1.0
Holdrege	89	17	49.2	6.01	T.
Hooper*[1]	91	32	50.6	1.02	0.8
Imperial	90	15	46.0	4.42	2.2
Johnstown	.....	.....	.....	2.10	1.0
Kearney	.....	.....	.....	4.00	3.0
Kennedy	91	21	48.8	2.94	1.0
Kimball	85	16	45.2	2.40	10.0
Kirkwood*[1]	90	26	46.9	2.54	1.0
Laclede	.....	.....	.....	2.35	4.5
Lena	.....	.....	.....	3.31	5.0
Lexington	87	20	48.0	3.14	2.0
Loup	.....	.....	.....	2.45	2.0
Lynch	90	18	51.2	1.33	2.0
McCook*[1]	89	20	47.9	2.60	T.
McCool	.....	.....	.....	1.58	2.0
Madison	87	28	49.2	1.86	2.5
Madrid	.....	.....	.....	2.80	3.0
Marquette	.....	.....	.....	2.45	4.0
Mason City	.....	.....	.....	3.48	2.0
Minden *a*	86	26	48.2	3.61	1.0
Monroe	.....	.....	.....	2.16	2.5
Nebraska City *b**[1]	86	28	52.8	2.40	2.0
Nebraska City *c*	90	26	52.0	1.77	.....
Nemaha*[1]	86	32	54.8	2.60	1.0
Nesbit	88	20	46.0	3.14	3.0
Norfolk	89	23	48.9	1.71	1.5
North Loup	89	24	49.1	2.68	2.0
Oakdale	90	23	48.9	2.24	1.9
Odell	.....	.....	.....	2.13	3.0
O'Neill	88	16	49.4	2.23	0.5
Ord	.....	.....	.....	3.03	.....
Osceola	.....	.....	.....	2.15	.....
Ough	.....	.....	.....	3.00	6.0
Palmer	.....	.....	.....	2.35	2.0
Palmyra*[1]	90	28	50.0	1.86	2.5
Plattsmouth *a*	.....	.....	.....	1.45	.....
Plattsmouth *b*	88	32	52.0	0.94	2.0
Pleasanthill	.....	.....	.....	0.40	3.0
Ravenna *a*	87	24	49.2	2.71	1.5
Ravenna *b*	.....	.....	.....	2.68	2.0
Redcloud *b*	.....	.....	.....	2.14	3.2
Republican*[1]	86	26	48.7	3.81	2.0
St. Libory	.....	.....	.....	2.71	1.0
St. Paul	87	24	49.8	2.54	1.5
Salem*[1]	85	32	53.4	2.76	.....
Santee	91	24	52.2	1.77	0.5
Schuyler	.....	.....	.....	1.85	3.0
Seneca*[1]	90	24	45.4	0.57	1.2
Seward	90	30	49.6	2.78	2.0
Spragg	.....	.....	.....	3.12	1.5
Springview	88	22	48.8	2.56	.....
Stanton*[1]	88	29	49.8	1.32	T.
State Farm	92	21	51.8	1.63	2.0
Strang	.....	.....	.....	1.72	3.0
Stratton	.....	.....	.....	3.00	.....
Superior	89	26	51.6	2.95	2.0
Syracuse	.....	.....	.....	1.74	2.0
Tablerock	.....	.....	.....	3.15	1.0
Tecumseh *b*	92	25	52.2	1.66	.....
Tecumseh *c*	.....	.....	.....	2.27	2.0
Tekamah	90	25	50.3	1.43	2.0
Turlington	90	27	50.5	1.76	3.0
Wakefield	89	22	49.6	1.38	1.0
Wallace	.....	.....	.....	1.45	.....
Wauneta	.....	.....	.....	3.42	0.2
Weeping Water	.....	.....	.....	1.59	3.5
Westpoint	90	26	51.7	1.43	.....
Whitman	.....	.....	.....	1.30	T.
Wilber*[1]	88	32	52.1	1.63	3.0
Willard	.....	.....	.....	2.55	T.
Wilsonville*[1]	86	28	49.5	3.35	3.0
Winnebago	.....	.....	.....	1.66	1.0
Wisner	.....	.....	.....	1.51	T.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Wymore	.....	.....	.....	2.29	T.
York	88	.....	.....	3.80	.....
Nevada.					
Amos	71	21	45.0	0.60	
Austin	69	13	41.9	0.15	
Battle Mountain*[1]	72	24	46.1	0.86	0.1
Belmont	67	11	40.0	0.38	2.0
Beowawe*[1]	80	28	51.6	0.25	
Candelaria	78	18	48.8	.....	
Carlin*[1]	75	25	43.2	0.50	
Carson City	71	17	44.2	0.92	0.8
Cranes Ranch	.....	.....	.....	0.13	
Elko (near)	66	16	44.8	0.33	3.3
Ely	72	3	41.4	1.20	4.5
Fenelon*[1]	71	15	40.8	0.50	5.0
Golconda*[1]	76	25	44.1	0.85	1.5
Halleck*[1]	74	17	43.4	0.20	2.0
Hamilton	66	5	36.2	0.86	8.6
Hawthorne	72	20	49.0	0.52	
Hot Springs*[1]	75	30	49.3	T.	
Humboldt*[1]	78	22	48.0	0.41	
Lee	.....	.....	.....	0.87	5.5
Lewers Ranch	70	17	44.6	2.20	4.0
Lovelocks*[1]	86	30	51.0	0.46	
Martins[c]	80	16	46.8	1.09	
Monitor Mill	69	−2	38.0	0.33	4.8
Owyhee	69	5	39.9	0.63	5.2
Palisade*[1]	75	23	50.2	0.50	1.0
Palmetto	74	9	43.6	0.85	3.0
Potts	78	0	42.3	0.06	1.0
Reno State University	71	21	45.2	0.32	0.4
Sodaville	81	25	49.7	1.12	1.0
Tecoma*[1]	65	30	47.2	0.60	6.0
Tybo	74	14	44.7	0.40	1.0
Verdi*[1]	70	16	48.7	0.60	
Wadsworth*[1]	72	28	50.6	0.30	
Wells*[1]	73	23	42.4	0.50	2.0
Wood	77	9	42.0	0.27	
New Hampshire.					
Alstead	81	26	44.2	5.07	T.
Berlin Mills	82	16	42.3	5.94	6.0
Bethlehem	77	23	45.4	3.08	13.5
Brookline*[1]	84	30	45.3	9.41	0.2
Concord	84	25	45.4	6.87	
Durham	74	27	42.8	7.94	
Grafton	83	21	43.6	5.75	2.0
Hanover	83	25	46.2	3.35	
Keene	86	23	45.6	3.77	T.
Littleton	78	22	45.0	2.42	8.0
Nashua	86	28	45.0	8.02	
Newton	75	25	42.5	9.40	T.
Peterboro	82	22	43.0	9.35	3.1
Plymouth	83	23	45.5	4.48	T.
Sanbornton	82	27	44.6	3.36	
New Jersey.					
Asbury Park	81	35	45.9	7.09	T.
Bayonne	84	34	48.8	5.88	
Belvidere	89	30	49.4	4.15	
Bergen Point	83	35	48.4	8.28	
Beverly	85	33	50.0	5.31	T.
Billingsport*[1]	81	39	48.9	6.67	
Blairstown	88	27	48.1	4.36	
Bridgeton	85	34	50.3	6.77	
Camden	84	36	50.0	5.54	
Cape May C. H.	77	32	47.8	4.75	
Charlotteburg	82	23	44.4	10.22	T.
Chester	83	32	46.3	7.92	
Clayton	82	33	49.2	5.38	
College Farm	85	32	48.3	7.39	
Deckertown	85	29	48.0	6.05	T.
Dover	85	32	46.0	7.53	
Egg Harbor City	77	29	47.6	5.64	
Elizabeth	87	34	49.6	8.27	
Flemington	85	32	49.4	5.57	
Freehold	82	32	47.6	7.07	
Friesburg	84	31	49.2	5.23	
Hammonton	.....	.....	.....	5.85	
Hanover	85	29	48.8	7.91	
Hightstown	84	35	49.5	6.29	
Imlaystown	86	34	50.6	5.82	
Lambertville	88	32	50.1	5.73	
Layton	86	24	46.4	5.72	
Moorestown	83	34	49.2	5.91	
Mount Pleasant	.....	.....	.....	4.97	
Newark	84	31	48.0	6.56	
New Brunswick	87	34	50.2	7.76	
Newton	86	30	47.6	5.59	1.0
Paterson	89	35	50.5	6.69	
Perth Amboy	85	32	48.6	7.59	
Plainfield	85	31	48.0	8.22	
Rancocas	.....	.....	.....	4.55	T.
Rivervale	85	26	48.8	5.80	
Roseland	83	29	46.8	8.26	
Salem	84	32	50.1	6.13	
Somerville	87	31	49.7	7.60	T.
South Orange	82	34	48.0	7.34	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
New Jersey—Cont'd.	°	°	°	Ins.	Ins.
Toms River	88	26	45.8	7.24	
Trenton	77	38	49.9	5.21	
Tuckerton	78	28	47.0	5.86	
Vineland	85	34	49.4	5.70	
Woodbine	84	30	47.2	5.86	
New Mexico.					
Alamagordo	......	......	......	0.41	3.5
Albert	83[e]	25[e]	53.4[e]	2.24	T.
Albuquerque	80	25	53.4	0.30	T.
Alma	78	16	49.4	0.10	
Bellranch	......	......	......	1.68	1.0
Bernalillo	85[b]	24[d]	54.0[e]	0.17	0.3
Bluewater	78	15	45.8	0.10	1.0
Cambray	......	......	......	0.10	
Deming	......	......	......	T.	T.
East Lasvegas	71	20	46.4	1.17	4.0
Engle	81	19	52.8	T.	T.
Espanola	78	13	48.6	0.62	3.5
Folsom	75	7	45.2	3.43	11.0
Fort Bayard	78	20	51.0	0.25	1.5
Fort Stanton	74[d]	18	46.7	0.90	T.
Fort Union	77	13	46.2	0.95	4.0
Fort Wingate	77	15	47.0	0.20	2.0
Gage	......	......	......	0.00	
Galisteo	77	20	49.2	0.20	2.0
Gallinas Spring	84	21	52.4	0.67	
Hillsboro	82	24	55.4	0.10	1.0
Horse Springs	77	18	47.7	0.18	1.0
Las Vegas Hotsprings	77	13	47.6	1.44	4.0
Los Lunas	82	25	55.4	0.35	
Lower Penasco	79	25	54.0	0.50	3.0
Mesilla Park	89	25	56.8	0.30	1.0
Raton	76	10	44.6	0.86	1.1
Roswell	87	22	57.0	0.97	T.
San Marcial	100	23	58.3	T.	T.
Socorro	84	22	54.8	0.21	1.0
Springer	80	10	48.8	1.48	1.8
Strauss	......	......	......	0.25	
Whiteoaks	78	19	50.8	1.14	7.0
Winsors Ranch	......	3	......	2.24	19.5
Woodbury	......	15	......	1.33	14.5
New York.					
Adams	......	......	......	6.11	10.0
Addison	83	24	46.0	5.82	14.0
Adirondack Lodge	69	14	40.6	3.90	22.0
Akron	......	......	......	5.89	......
Alden	76	22	44.8	4.34	17.3
Alfred	79	21	43.8	7.17	19.0
Angelica	82	20	43.8	5.29	11.0
Appleton	78	27	44.2	5.08	T.
Atlanta	78	23	43.7	5.97	16.0
Auburn	80	26	47.4	5.52	5.0
Avon	77	25	45.1	5.52	17.0
Axton	81	12	41.2	2.41	......
Baldwinsville	74	29	47.5	4.23	......
Bedford *a*	85	29	46.9	10.65	......
Blue Mountain Lake	......	......	......	3.05	8.0
Bolivar	82	17	43.0	4.53	11.3
Bouckville	76	23	44.0	3.87	9.5
Boyds Corners	......	......	......	8.48	......
Brockport	76	29	45.4	6.77	15.0
Caldwell	77	25	45.8	4.85	T.
Canaan Four Corners	78	23	45.2	5.06	......
Canajoharie	78	25	45.2	5.60	......
Canton	77	20	44.0	3.86	T.
Carmel	81	35	49.0	7.93	......
Carvers Falls	......	......	......	4.10	......
Catskill	81	28	48.8	......	......
Cedarhill	86	29	49.0	5.68	......
Chenango Forks	......	......	......	3.15	12.0
Cooperstown	76	23	43.3	4.73	4.0
Cortland	......	......	......	3.31	......
Cutchogue	69	33	46.0	8.56	
Dekalb Junction	......	......	......	4.36	5.0
Easton	......	......	......	5.97	......
Elba	79	27	46.6	4.25	......
Elmira	81	24	46.6	5.56	3.5
Franklinville	79	20	43.0	5.05	20.1
Fulton	......	......	......	4.29	......
Gabriels	77	19	41.4	3.04	3.0
Glens Falls	85	28	48.4	3.77	T.
Gloversville	80	25	46.0	3.72	T.
Greenwich	80[d]	26[d]	47.3[d]	3.93	T.
Griffin Corners	82	20	43.4	8.03	8.9
Haskinville	......	......	......	4.58	12.5
Hemlock	75	28	44.8	5.65	21.5
Honeymead Brook	80	28	47.2	6.78	
Honnedaga Lake	......	......	......	1.65	6.0
Humphrey	83	24	42.9	5.93	24.5
Indian Lake	80	16	43.0	1.88	6.0
Ithaca	76	27	45.0	4.08	7.9
Jamestown	76[e]	27[d]	44.6[d]	4.85	29.5
Jay	84	24	45.9	2.68	2.0
Keene Valley	81	20	43.4	6.75	6.5
King Ferry	......	......	......	4.86	7.2
King Station	......	......	......	6.10	2.5

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
New York—Cont'd.	°	°	°	Ins.	Ins.
Liberty	85	22	45.4	4.11	2.0
Littlefalls, City Res.	77	24	45.2	3.33	T.
Lockport	......	......	......	6.47	13.0
Lowville	79	24	44.8	3.55	2.0
Lyndonville	......	......	......	4.43	
Mayle	......	......	......	4.13	13.5
Meredith	75	23	42.4	2.96	12.0
Middletown	81	31	47.5	9.11	T.
Mohonk Lake	75	29	45.1	11.32	4.0
Moira	79	22	44.2	4.16	5.0
Newark Valley	......	......	......	5.43	......
New Lisbon	80	19	43.0	3.38	3.5
North Germantown	......	......	......	6.84	......
North Hammond	74	28	47.8	5.42	4.1
North Lake	79	17	40.8	......	......
Number Four	76	22	43.2	0.95	7.4
Ogdensburg	75	24	45.6	4.49	T.
Old Chatham	......	......	......	4.14	......
Oneonta	83	20	46.3	3.93	2.7
Oxford	80	20	44.5	3.33	12.5
Palermo	71	23	45.7	4.77	
Penn Yan	80	25	46.5	6.00	19.0
Perry City	77	20	43.7	4.85	10.7
Plattsburg Barracks	......	......	......	2.82	......
Port Byron	74	22	45.8	5.60	10.0
Port Jervis	87	28	47.7	6.73	3.0
Primrose	80	32	47.9	9.02	......
Richmondville	82	24	44.0	6.82	9.5
Ridgeway	75	27[e]	45.0[e]	4.30	15.2
Rome	74	25	44.8	3.26	......
Romulus	78	29	46.5	4.91	9.0
Salisbury Mills	......	......	......	8.20	......
Saranac Lake	79	19	42.8	2.85	10.2
Saratoga Springs	79	28	48.2	5.90	T.
Scottsville	......	......	......	4.98	......
Setauket	74	34	45.8	8.23	......
Shortsville	76	27	45.7	4.93	6.0
Skaneateles	......	......	......	4.85	......
Southampton	63	33	45.2	6.84	......
South Berlin	84	26	48.4	3.94	T.
South Canisteo	79	21	43.0	7.07	16.0
Southeast Reservoir	......	......	......	7.61	......
South Schroon	82	24	43.6	4.03	5.0
Straits Corners	77	25	44.2	5.75	14.0
Ticonderoga	77	27	46.5	3.39	4.0
Volusia	75	25	43.4	6.20	......
Walton	81	20	45.0	4.17	1.1
Wappingers Falls	82	24	49.0	9.07	......
Warwick	......	......	......	5.50	......
Watertown	74	23	45.6	3.78	4.5
Waverly	84	25	46.5	5.87	4.3
Wedgwood	76	27	43.4	5.44	16.0
Wells	86	21	45.2	4.41	0.8
West Berne	83	23	44.8	7.12	4.0
West Chazy	75	27	45.4	......	......
Westfield *a*	76	26	43.8	4.83	41.0
Westfield *b*	77	27	44.2	6.65	......
Westfield *c*	72	26	42.0	3.84	24.5
Windham	80	22	43.6	9.56	6.0
Wolcott	......	......	......	6.75	0.5
North Carolina.					
Abshers	89	30	51.0	9.21	0.1
Asheville	......	......	......	4.56	3.1
Biltmore	76	26	48.8	3.99	3.0
Bryson City	......	......	......	6.64	......
Chapelhill	85	35	52.8	5.89	T.
Cherryville	85	31	52.5	8.86	T.
Currituck	......	......	......	4.15	
Durham	76	35	52.4	5.68	
Edenton	76	37	54.4	4.51	
Fayetteville	83	35	55.4	3.46	
Flatrock	84	28	48.2	9.16	1.0
Goldsboro	74	39	54.7	3.29	
Greensboro	79	34	51.8	5.66	
Henderson	81	34	52.5	6.10	
Hendersonville	83	28	48.6	8.52	1.2
Henrietta	87	32	54.5	8.45	T.
Highlands	74	21	41.9	9.35	7.2
Kinston	84	35	55.4	4.74	
Lenoir	88	32	52.6	9.59	T.
Linville	73	22	41.7	......	8.0
Littleton	82	33	51.8	4.75	T.
Louisburg	83	34	53.2	5.22	
Lumberton	76	38	55.3	4.25	
Marion	87	30	52.0	9.33	1.5
Marshall	82	28	47.6	4.79	11.2
Mocksville	78	31	52.6	6.59	T.
Moncure	83	29	53.4	5.30	
Monroe	81	30	50.6	8.54	T.
Morganton	84	32	52.6	7.90	T.
Mountairy	85	30	52.0	6.60	T.
Murphy	......	......	......	5.37	......
Newbern	76	37	55.3	3.83	
Oakridge	82	33	51.2	5.98	0.5
Patterson *1	80	32	48.8	10.53	0.5
Pittsboro	86	30	53.0	4.64	T.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
North Carolina—Cont'd	°	°	°	Ins.	Ins.
Redsprings	83	33	55.0	3.27	
Rockingham	77	34	53.6	4.61	T.
Roxboro	82	35	52.1	6.15	T.
Salem	87	33	52.6	6.11	
Salisbury	88	34	53.4	8.14	T.
Saxon	85	32	52.8	5.42	T.
Selma	85	34	52.8	5.07	
Settle	84	36	54.0	6.99	T.
Sloan	82	32	53.8	2.56	
Soapstone Mount	83	29	48.8	6.04	T.
Southern Pines *a*	87	34	56.6	5.73	
Southern Pines *b*	83	34	54.2	4.04	
Southport	75	39	56.8	3.48	
Springhope *1	78	34	53.2	5.35	
Statesville	86	28	51.2	8.23	0.5
Tarboro	80	35	55.0	5.45	
Washington	87	39	55.5	3.76	T.
Waynesville	76	26	45.6	6.12	2.2
Weldon *a*	73	38	25.5	5.88	T.
Weldon *b*	......	......	......	4.93	
North Dakota.					
Amenia	86	20	46.5	1.90	0.2
Ashley	89	11	44.7	0.45	2.0
Berlin	85	14	45.2	1.00	0.5
Bottineau	82	12	40.6	0.17	1.7
Buxton	79	21	43.8	2.27	......
Cando	82[f]	15[f]	40.7[f]	0.26	......
Churchs Ferry	84	18	43.0	0.08	0.2
Coalharbor	86	13	43.5	T.	T.
Devils Lake	80	17	42.9	0.24	......
Dickinson	92	16	46.3	0.62	T.
Donnybrook	......	......	......	0.74	0.1
Dunseith	84	16	41.4	0.40	......
Ellendale	87	16	47.9	1.14	......
Falconer	88	10	46.6	1.82	......
Fargo	86	23	45.5	1.76	......
Forman	84	18	45.6	0.51	0.4
Fort Berthold	92	13	46.8	0.47	......
Fort Yates	84	14	46.6	0.12	......
Fullerton	88	16	46.0	1.65	4.5
Gallatin	83	16	43.7	1.78	0.3
Glenullin	90	13	45.6	0.42	T.
Grafton	78[c]	18	44.0[d]	0.45	T.
Hamilton	78	15	42.5	0.87	......
Hannaford	83	19	44.4	1.17	T.
Jamestown	82	16	45.3	0.96	3.0
Langdon	70	24	44.0	1.21	......
Larimore	80	19	42.2	2.89	......
Lisbon	89	18	44.7	1.68	......
McKinney	89	12	41.9	0.21	2.1
Mayville	85	23	46.0	1.94	T.
Medora	92	15	49.4	0.60	......
Melville	82	18	45.0	0.52	T.
Milton	73	15	40.2	0.93	0.3
Minto	82	17	44.6	1.86	......
Napoleon	87	11	45.4	1.26	5.0
New England	89	14	44.3	T.	
Oakdale	87	15	43.7	0.94	0.5
Pembina	76	13	41.5	1.11	......
Portal	70	12	41.2	1.10	......
Power	90	20	46.0	1.70	1.5
Steele	85	11	45.2	T.	......
University	79	21	45.2	2.06	1.5
Wahpeton	87	22	48.2	2.65	......
Willow City	86	17	43.8	0.16	T.
Woodbridge	83	14	42.4	0.23	0.2
Ohio.					
Akron	83	26	45.3	4.17	26.6
Annapolis	91	21	47.4	8.10	6.5
Ashland	82	24	46.4	1.92	12.0
Ashtabula	71	26	41.6	2.72	12.5
Atwater	......	......	......	5.18	16.0
Bangorville	87	23	46.8	1.36	4.8
Bellefontaine	81	29	46.1	1.74	......
Bement	96	24	42.2	2.31	7.0
Benton Ridge	85	25	46.6	2.03	4.0
Bethany	86	20	48.0	2.11	......
Binola	......	......	......	3.32	12.0
Bladensburg	84	19	47.6	3.64	11.5
Bloomingburg	86	28	48.0	2.25	......
Bowling Green	84	22	46.6	2.23	2.5
Bucyrus	82	22[d]	44.7	2.10	......
Cambridge	84	22	47.2	5.62	20.0
Camp Dennison	87	26	48.8	2.27	2.8
Canal Dover	84	21	45.0	4.38	22.0
Canton	82	24	45.4	6.17	42.0
Cardington	87	20	45.9	1.12	2.0
Cedarville	......	......	......	1.38	3.0
Celina	89	24	49.8	2.27	T.
Chillocothe	85	25	47.0	4.82	12.7
Circleville	86	26	47.9	3.82	7.5
Clarksville	84	30	48.5	1.85	2.5
Cleveland *a*	80	28	45.1	2.97	13.3
Cleveland *b*	82	30	45.4	2.16	......
Clifton	85	26	47.8	1.77	4.0
Coalton	85[k]	24	48.0[f]	4.20	7.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
Colebrook	82	31	44.5	3.05	21.5
Dayton *a*	.....	.....	.....	2.10	0.7
Dayton *b*	86	25	48.0	1.87	3.5
Defiance	85	23	45.4	1.87	0.2
Delaware	85	25	47.0	1.60	1.6
Demos	81	25	45.2	7.84	.....
Elyria	85	23	46.1	3.68	8.0
Findlay	85	27	48.0	2.46	.....
Frankfort	84	23	46.2	3.43	20.0
Garrettsville	81	21	44.8	4.32	25.7
Granville	85	28	46.6	2.97	14.0
Gratiot	83	26	46.4	5.77	42.0
Green	85	27	48.8	3.90	2.0
Greenhill	81	18	44.0	5.83	30.0
Greenville	81	25	47.0	3.02	2.0
Hanging Rock	89	27	48.6	6.90	.....
Hedges	85	24	47.8	2.19	T.
Hillhouse	79	19	42.2	2.53	16.0
Hillsboro	85	28	48.6	3.90	4.0
Hiram	81	26	45.4	4.40	20.0
Hudson	84	23	44.8	4.35	14.0
Jacksonboro	87	30	49.0	1.45	3.0
Killbuck	82	24	46.1	2.11	18.0
Lancaster	82	25	46.8	4.25	30.0
Leipsic	.....	.....	.....	1.81	1.0
Lima	85	21	46.6	2.17	1.0
Lordstown	83	21	44.5	8.21	23.0
Lowell	.....	.....	.....	8.96	.....
McConnelsville	85	22	46.6	6.91	13.0
Manara	.....	.....	.....	2.79	.....
Mansfield	.....	.....	.....	3.30	8.0
Marietta	85	29	49.7	7.13	5.0
Marion	87	24	47.8	2.07	0.2
Medina	84	.....	.....	3.69	14.0
Milfordton	81	24	45.0	2.06	9.0
Milligan	84	20	46.2	5.14	11.0
Millport	83	21	45.0	7.39	20.0
Montpelier	84	23	47.2	2.82	1 5
Moorfield	82	20	46.6	7.35	12.0
Napoleon	85	31	47.8	2.01	3.0
New Alexandria	88	24	47.2	7.56	5.0
New Berlin	82	25	45.3	5.16	20.0
New Bremen	84	27	47.4	2.11	3.0
New Holland	86	25	47.4	3.16	11.0
New Paris	84	29	47.9	2.29	4.0
New Richmond	83	24	46.8	2.67	8.5
New Waterford	87	23	46.0	6.96	30.0
North Lewisburg	83	28	46.9	1.70	2.0
North Royalton	83	23	45.0	2.81	12.0
Norwalk	81	25	45 2	1.88	3.0
Oberlin	85	20	45.4	2.81	.....
Ohio State University	84	24	47.2	2.13	2.0
Orangeville	82	20	44.7	3.50	15.0
Ottawa	86	23	48.1	2.34	T.
Pataskala	83	24	46.7	3.20	16.5
Philo	83	26	47.2	5.60	21.5
Plattsburg	84	26	47.2	1.86	4.0
Pomeroy	86	27	47.6	4.95	8.8
Portsmouth *a*	.....	.....	.....	5.24	2.0
Portsmouth *b*	89	30	49.8	5.24	5.0
Pulse	.....	.....	.....	2.50	.....
Red Lyon	.....	.....	.....	2.23	.....
Richwood	86	24	49.2	1.44	1.0
Ripley	85	29	48.8	3.72	5.0
Rittman	82	21	45.0	3.57	5.0
Rockyridge	86	23	45.8	2.29	T.
Rosewood	84	27	47.2	1.85	3.0
Shenandoah	83	22	45.3	1.86	3.0
Sidney	89	27	48.0	2.07	1.7
Sinking Spring	87	29	48.6	4.65	16.0
Somerset	84	29	47.2	7.11	.....
Springfield	.....	.....	.....	1.61	.....
Strongsville	.....	.....	.....	4.06	7.0
Swanton	.....	.....	.....	2.12	T.
Thurman	85	28	48.5	4.55	13.0
Tiffin	83	27	47.0	2.05	2.2
Upper Sandusky	85	26	48.6		
Urbana	82	27	47.4	1.74	1.5
Vanwert	85	19	47.3	2.11	.....
Vermillion	85	25	45.2	2.34	6.5
Vickery	85	21	46.0	2.57	0.1
Walnut	.....	.....	.....	3.21	8.5
Warren	83	22	45.0	6.61	38.2
Warsaw	84	18	45.6	3.58	30.0
Wauseon	86	22	47.6	2.99	1.7
Waverly	88	26	49.2	4 35	9.7
Waynesville	84	28	48.4	1.95	3.0
Wellington	85	23	45.8	2.44	11.0
Westerville	84	26	47.2	1.70	2.0
Willoughby	.....	.....	.....	2.28	5.0
Wooster	82	22	45.2	2.46	14.0
Zanesville	.....	.....	.....	6.52	.....
Oklahoma.					
Arapaho	91	28	58.1	1.54	T.
Beaver	90	24	56.6	3.63	2.2
Blackburn	92	27	57.0	3.20	T.
Oklahoma—Cont'd.					
Burnett	91	27	58.2	1.99	T.
Clifton	94	25	58.0	1.79	T.
Fort Reno	90	29	57.2	1.77	T.
Fort Sill	90	30	60.6	2.35	
Hennessey	93	30	57.4	2.00	T.
Jefferson	93	25	55.1	3.97	
Jenkins	94	25	54.9	7.89	2.0
Kenton	86	23	53.0	1.76	1.5
Kingfisher	91	30	58.2	1.72	T.
Mangum	92	34	60.6	3.15	T.
Newkirk	89	.....	.....	4.75	
Norman	89	29	56.2	2.22	
Pawhuska	97	27	57.6	3.33	
Perry	88	29	56.2	3.18	
Sac and Fox Agency	90	25	55.8	2.39	T.
Stillwater	90	30	57.6	1.29	
Taloga	94	30	57.5	3.25	
Texmo	.....	.....	.....	3.35	4.5
Vittum	91	32	58.4	1.17	0.5
Waukomis	93	27	57.0	2.62	
Woodward	91	27	58.6	6.15	3.0
Oregon.					
Albany *a* *[1]	70	37	49.0	2.73	
Albany *b*	.....	.....	.....	2.61	
Alpha	74	28	47.8	9.20	T.
Arlington	73	29	51.3	0.15	
Ashland *b*	75	25	47.2	0.99	5.6
Aurora *[1]	78	35	51.7	2.20	
Aurora (near)	72	29	48.4	3.05	
Bay City	64	29	46.2	11.60	
Bend	68	11	39.5	.....	
Beulah	74	17	44.3	1.79	T.
Blalock	74	31	53.0	0.19	
Brownsville *[1]	76	38	50.8	1.97	
Bullrun	65	31	45.1	5.75	.....
Burns	69	15	41.2	0.34	2.5
Cascade Locks	73	34	52.4	5.61	
Comstock *[1]	74	34	49.1	3.31	
Coquille	.....	.....	.....	5.60	
Corvallis	72	31	49.8	3.09	
Dayville	75	22	46.2	0.87	1.7
Ella	.....	.....	.....	0.18	
Eugene	67	31	48.2	2.59	
Fairview	65	28	48.6	5.49	0.5
Falls City	69	29	46.6	8.24	0.3
Forest Grove	72	29	48.0	5.08	
Gardiner	66	32	49.0	7.66	
Glenora	72	28	46.4	13.05	9.0
Government Camp	70	17	38.3	6.03	53.0
Grants Pass	78	25	48.6	2.60	
Hare	68	32	45.2	8.30	4.0
Harris	70	26	46.9	2.50	4.0
Heppner	70	25	46.3	0.15	T.
Hood River (near)	74	28	48.1	2.82	T.
Huntington	76	24	50.6	1.21	
Jacksonville	75	26	48.1	1.10	T.
Joseph	66	14	39.5	0.28	2.0
Junction City *[1]	70	39	49.6	2.62	
Kerby	78[d]	24	48.8[d]	5.55	3.0
Klamath Falls	70	20	43.7	.....	1.0
Lafayette *[1]	70	34	51.7	2.36	
Lagrande	67	22	44.0	1.00	3.0
Lakeview	70	15	42.0	1.07	4.0
Lonerock	69	18	41.1	0.96	4.6
McMinnville	70	30	47.8	5.11	
Merlin *[1]	75	30	52.6	1.98	
Monroe	68	30	48.0	4.09	.....
Mount Angel	68	32	48.3	3.23	
Nehalem	.....	.....	.....	8.10	0.5
Newberg	71	30	49.3	4.29	T.
Newbridge	69	23	42.6	1.95	
Newport	62	33	47.0	7.63	
Pendleton	76	25	51.8	0.69	1.0
Placer	.....	.....	.....	3.42	6.0
Prineville	76	13	47.4	T.	T.
Riddles *[1]	76	32	47.5	2.72	
Riverside	77	20	45.7	1.02	T.
Sheridan *[1]	65	34	46.2	4.23	
Silverlake	70	11	38.9	0.10	1.0
Silverton *[1]	68	38	49.6	3.16	
Sparta	66	15	41.4	1.38	9.0
Springfield *[1]	67	35	49 0	3.08	
Stafford	72	28	47.8	4.11	
The Dalles	75	28	50.8	0.09	
Tillamook	.....	.....	.....	4.09	.....
Toledo	64	28	45.2	7.01	
Umatilla	.....	.....	.....	0.15	
Vale	75	19	45.4	1.04	
Westfork *[1]	72	35	49.3	3.95	2 0
Weston	67	25	46.6	1.27	2.5
Williams	72	24	46.4	1.26	T.
Pennsylvania.					
Aleppo	82	22	46.2	4.40	4.0
Altoona	85	25	46.1	6.22	.....
Athens	83	26	46.2	5.40	2.5
Beaver Dam	.....	.....	.....	7.19	.....
Pennsylvania—Cont'd.					
Bellefonte	88	26	49.7	5.10	6.0
Bethlehem	.....	.....	.....	4.42	.....
Brookville	.....	.....	.....	5.82	10.9
Browers Lock	.....	.....	.....	4.99	.....
Butler	83	21	45.2	7.56	4.8
Carlisle	95	32	51.2	1.46	
Cassandra	83	22	44.8	5.34	16.5
Chambersburg	87	30	47.7	9.18	.....
Coatesville	87	30	49.4	5.88	
Confluence	81	22	44.4	5.86	0.0
Davis Island Dam	.....	.....	.....	7.56	.....
Derry Station	85	25	46.4	8.41	3.0
Doylestown	.....	.....	.....	5.34	.....
Drifton	82	30	46.6	3.60	3.0
Driftwood	.....	.....	.....	5.30	.....
Duncannon	.....	.....	.....	3.49	.....
Dushore	75	19	43.2	5.50	6.7
East Bloomsburg	.....	.....	.....	3.45	4.0
East Mauch Chunk	88	30	48.0	4.68	.....
Easton	83	33	49.0	4.39	T.
Ellwood Junction	.....	.....	.....	8.35	1.0
Emporium	83	22	45.8	5.03	4.5
Ephrata	85	30	49.1	3.73	
Everett	82	31	47.6[c]	5.16	3.0
Forks of Neshaminy *[1]	77	36	47.9	4.77	.....
Franklin	82	18	46.0	5.64	2.0
Freeport	.....	.....	.....	8.93	3.0
Girardville	.....	.....	.....	2.52	8.0
Grampian	88	22	47.8	5.22	20.0
Hamburg	.....	.....	.....	4.80	.....
Hamlinton	81	29	44.4	5.00	7.5
Hawthorn	92	16	47.2	7.10	13.5
Herrs Island Dam	.....	.....	.....	7.73	.....
Huntingdon *a*	88	25	48.7	5.15	3.0
Huntingdon *b*	.....	.....	.....	4.18	2.7
Irwin	.....	.....	.....	7.77	8.0
Johnstown	86	27	48.4	6.06	2.0
Keating	.....	.....	.....	5.41	4.0
Kennett Square	83	34	49.8	5.69	.....
Lancaster[c]	89	32	49.6	.....	.....
Lawrenceville	82	22	44.6	5.64	4.0
Lebanon	86	30	49.0	4.02	.....
Leroy	80	27	44.1	4.68	12.0
Lewisburg	87	29	48.9	4.39	4.0
Lockhaven *a*	90	27	50.2	4.70	10.0
Lockhaven *b*	.....	.....	.....	5.67	.....
Lock No. 4	.....	.....	.....	8.52	6.5
Lycippus	81	24	45.0	8.23	10.1
Mifflin	.....	.....	.....	2.30	.....
Oil City	.....	.....	.....	5.99	2.6
Ottsville	.....	.....	.....	4.86	.....
Parker	.....	.....	.....	7.57	3.0
Philadelphia	82	37	50.3	5.13	
Point Pleasant	.....	.....	.....	5.87	.....
Quakertown	85	32	48.7	5.54	.....
Reading[2]	.....	.....	49.9	5.01	.....
Renovo *a*	.....	.....	.....	6.22	T.
Renovo *b*	88	26	48.8	5.71	2.0
Saegerstown	82	20	43.8	4.83	26.0
St. Marys	83	22	44.8	5.92	18.0
Seisholtzville	.....	.....	.....	5.85	.....
Selinsgrove	87	28	49.0	3.73	6.0
Shawmont	.....	.....	.....	4.21	.....
Shinglehouse	86	22	46.2	4.01	11.0
Smethport	81	20	43.9	5.70	15.0
Smiths Corners	.....	.....	.....	5.18	.....
Somerset	80	24	44.4	7.85	20.7
South Eaton	82	29	47.2	4.21	.....
State College	82	25	46.4	4.62	11.3
Sunbury	.....	.....	.....	1.83	.....
Swarthmore	80	37	50.4	4.75	.....
Towanda	81	26	46.0	4.65	4.0
Troutrun	.....	.....	.....	8.19	2.0
Uniontown	80	30	48.1	8.55	6.0
Warren	78	20	43.4	2.53	4.5
Wellsboro	81	26	45.8	4.46	6.0
Westchester	83	36	49.6	6.18	.....
West Newton	.....	.....	.....	8.69	10.0
Wilkesbarre	84	26	48.2	8.11	T.
Williamsport	84	27	49.6	5.57	2.5
York	88	29	48.9	2 51	T.
Rhode Island.					
Bristol	63	34	44.8	5.88	
Kingston	74	30	43.9	8.78	
Pawtucket	75	39	47.6	7.04	
Providence *a*	73	34	46.4	8.90	
Providence *c*	74	32	44.6	8.31	
South Carolina.					
Allendale	79	36	59.2	2.90	
Batesburg	80	36	54.6	6.47	
Beaufort	83	43	60.5	3.11	
Calhoun Falls	.....	.....	.....	7.13	
Camden	.....	.....	.....	5.14	
Cheraw *a*	77	37	54.6	4.51	
Cheraw *b*	.....	.....	.....	4.63	
Clemson College	88	31	54.0	6.69	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
South Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Conway				3.20	
Darlington				4.18	
Edisto				3.99	
Effingham				4.84	
Florence	79	39	56.3	4.74	
Gaffney				7.64	
Georgetown	84	40	59.6	2.95	
Gillisonville	81	31	57.5	4.06	
Greenville	78	34	51.7	7.13	T.
Greenwood	76	33	53.8	6.48	
Kingstree *a*	76	38	56.4	2.76	
Kingstree *b*				2.92	
Liberty	81	30	52.0	8.07	T.
Little Mountain	84	34	55.7	8.11	
Longshore	85	32	54.5	7.42	T.
McCall	86	35	56.5	3.29	
Pinopolis *[1]	77	38	57.3	4.16	
St. Georges	76	36	57.0	4.73	
St. Matthews	76	38	57.6	4.57	
St. Stephens				3.11	
Santuck	85	34	53.6	6.78	
Shaws Fork	82			5.30	
Smiths Mills				4.08	
Society Hill	86	38	56.0	3.63	
Spartanburg	89	35	54.8	7.29	
Statesburg	83	37	57.2	6.36	
Summerville	79	35	57.6	4.50	
Temperance	85	37	55.4	4.78	
Trenton	81	38	57.8	6.73	
Trial	78	33	53.8	3.07	
Walhalla	86	33	53.0	7.55	T.
Winnsboro	80	35	53.7	6.59	
Winthrop College	83	34	54.0	7.19	T.
Yemassee	75	41	57.6	3.45	
Yorkville	88	36	56.3	10.58	T.
South Dakota.					
Aberdeen	95	15	45.8	1.95	8.0
Academy	92	22	50.0	2.08	T.
Alexandria	94	22	49.8	1.70	2.0
Armour		20		1.37	2.0
Ashcroft	94	12	48.1	0.40	
Badnation	95	17	50.1	1.36	0.5
Bowdle	90	15	47.9	1.07	
Brookings	90	21	47.1	1.40	4.0
Bulkley	94	18	49.0	1.03	
Canton	89	22	50.4	1.48	T.
Centerville				1.64	1.4
Chamberlain	93	20	52.0	0.85	0.2
Clark	87	18[e]	46.8[e]	1.97	5.0
Desmet	90	22	48.7	2.70	5.0
Doland	89	15	47.4	2.79	3.1
Elkpoint	92	24	51.3	1.59	0.8
Farmingdale				1.93	T.
Faulkton	92	18	47.1	1.19	2.0
Flandreau	90	22	48.6	2.81	6.0
Forestburg	96	17	49.8	1.49	
Fort Meade	85	21	46.4	1.68	6.0
Fort Randall	94[h]	21[h]	50.0[h]	1.29	
Gary	91	18	46.6	1.00	8.0
Grand River School	92	13	49.3	0.71	T.
Greenwood	90	24	51.8	1.72	
Hartman	92	21	47.2	1.75	3.5
Highmore	90	18	46.8	1.60	4.0
Hitchcock				1.34	
Hotch City	93	16	49.2	1.48	2.0
Howard	88	21	46.9	2.40	
Interior	92	21	51.2	0.87	
Ipswich	92	13	47.4	1.10	3.0
Kimball	92	20	49.2	0.98	T.
Leola	84	14	44.0	1.12	4.0
Leslie	95	20	51.2	1.23	
Mellette	91	17	50.4	1.08	7.0
Menno	92	23	50.3	1.45	2.0
Millbank	88	22	46.1	2.28	
Mitchell	93	21	50.0	1.84	
Mound City	92	15	47.9	0.12	1.0
Oelrichs	88	22	47.2	2.95	T.
Pine Ridge	89	24	49.2	1.54	1.0
Plankinton	91	20	49.3	1.21	
Redfield	92	11	46.6	1.03	3.0
Rochford	83	2	39.6	2.40	11.0
Rosebud	90	20	49.3	2.66	5.0
St. Lawrence	93	16	49.0	1.80	
Silver City				1.99	7.0
Sioux Falls	89	24	49.0	2.29	
Sisseton Agency	85	19	46.0	3.47	9.0
Spearfish	86	20	47.3	0.97	16.0
Tyndall [h]		22		1.00	
Vermillion	90	26	51.4	1.89	0.5
Waubay	84	18	45.7	1.63	3.2
Wentworth	91	22	47.8	1.89	3.5
Wolsey				1.46	2.0
Tennessee.					
Andersonville	87	30	50.0	5.99	2.0
Arlington	86	35	55.5	1.95	
Ashwood	87	32	53.6	4.50	
Tennessee—Cont'd.	°	°	°	*Ins.*	*Ins.*
Benton	85	32	52.4	7.26	
Bluff City				3.32	11.0
Bolivar	85	33	54.0	2.82	
Bristol	84	23	48.8	3.58	8 5
Brownsville	85	35	53.0	2.60	
Byrdstown	86	26	51.2	6.77	2.2
Carthage		34		5.35	
Charleston				7.69	
Clarksville	85	32	53.2	3.77	
Clinton				6.75	T.
Covington	85	38	57.8	4.15	
Decatur	88	32	53.0	6.76	T.
Dickson	86	31	53.4	4.12	
Dover	88	30	54.3	3.60	
Dyersburg	90	39	56.9	7.37	
Elizabethton	84	26	48.2	5.27	15.0
Elk Valley	86	29	48.9	3.23	4.4
Erasmus	83	27	48.5	8.55	T.
Florence	82	32	52.6	5.27	T.
Franklin	85	33	53.2	5.24	
Grace *[1]	90	28	52.8	6.20	T.
Greeneville	83	26	48.2	5.18	15.0
Harriman	86	32	52.0	6.14	T.
Hohenwald	88	31	53.9	4.87	
Iron City	89	29	55.0	4.28	
Jackson	88[d]	36[d]	56.8[d]		
Johnsonville	90	28	54.1	3.01	
Jonesboro *[1]	78	32	48.3	5.07	24.6
Kingston				6.29	T.
Lafayette *[5]	85	32	47.2	6.45	T.
Lewisburg	86	33	53.2	5.73	0.3
Liberty	90	32	54.1	5.14	
Lynnville	85	32	52.9	4.86	T.
McMinnville	90	30	53.5	6.05	
Maryville	87	32	51.4	6.08	6.0
Milan	85	36	55.0	3.47	
Newport	82	32	50.9	5.00	14.0
Nunnelly	90	27	53.6	3.03	
Oakhill	88	29	51.2	7.66	T.
Palmetto	85	32	53.4	5.23	T.
Peryear *[5]	86	37	53.5	4.12	T.
Pope	90	29	55.2	2.93	
Rogersville	83	31	50.2	4.99	10.8
Rugby	70[e]	29[e]	45.0[e]	8.72	3.0
Savannah	88	34	55.9	3.30	
Sewanee	83	28	50.7	3.85	
Silverlake				6.51	12.0
Springdale	89	28	50.2	6.02	4.0
Springfield	89	30	52.4		
Tazewell				5.58	3.0
Tellico Plains	87	31	52.6	7.56	2.0
Tracy City	84	29	50.0	6.88	T.
Tullahoma	85	31	52.2	4.95	T.
Union City				2.65	
Waynesboro	88	30	54.6	3.39	
Wildersville	84	33	55.4	3.44	
Yukon	89	31	55.6	5.49	
Texas.					
Alvin				1.76	
Anna	92	31	60.2	2.40	
Anson				0.80	
Arthur				2.68	
Austin *a* [h]	84	35	60.7	1.90	
Austin *b* *[5]	88	39	63.3		
Ballinger	91	31	61.4	2.19	
Bastrop	91	36	66.6	1.38	
Beaumont	88	44	65.8	1.95	
Bigspring				1.07	
Blanco	88	34	60.6	1.33	
Boerne *[1]	86	38	64.4	1.15	
Booth				1.24	
Bowie	92	30	62.1	1.59	
Brazoria	84[e]			2.94	
Brenham	87	44	65.8	2.30	
Brighton	84	46	69.2	0.52	
Burnet *[1]	86	39	66.0	1.18	
Coleman	86	36	61.0	1.88	
Colorado	89[d]	30[d]	63.2[d]	0.91	
Columbia	86	37	64.4	1.86	
Comanche	90	31	62.7	0.74	
Corsicana	90	38	59.6	1.14	
Cuero	88	40	65.5	2.67	
Dallas	91	36	60.6	1.76	
Danevang	87	37	65.8	2.52	
Dublin	89			2.10	
Duval	87	41	64.3	1.88	
Estelle	94	34	62.8	1.76	
Fort Clark		36		3.00	
Fort McIntosh	93	43	72.8	0.72	
Fort Ringgold	100	43	76.2	T.	
Fort Stockton				0.08	
Fredericksburg *[1]	86[e]	40	63.4[e]	1.47	
Gainesville	91[e]	30[b]	60.2[e]	1.86	
Grapevine	93	33	63.6	2.23	
Greenville	89	33	61.4	1.81	
Hale Center	84	26	57.8	3.56	1.5
Texas—Cont'd	°	°	°	*Ins.*	*Ins.*
Hallettsville	87	42	67.2	1.81	
Haskell	98	30	63.5	0.31	
Henrietta	92	33	60.8	1.60	
Hewitt				1.92	
Hondo				1.04	
Houston				1.10	
Huntsville	88	38	63.0	3.08	
Ira	91	29	63.8	1.34	
Jacksonville	86	33	61.8	3.89	
Jasper	86	39	65.6	1.85	
Kaufman	93	35	63.9		
Kent				0.52	T.
Kerrville	87	30	63.2	0.69	
Kopperl				1.85	
Lampasas	90	34	64.2	1.00	
Laureles Ranch				0.50	
Llano *[5]	88	40	65.0	1.25	
Longview	90	35	62.2	3.52	
Luling	89	39	66.0	0.61	
Mann	88	34	60.1	2.45	
Menardville	90	31	62.2	0.15	
Mount Blanco				1.42	3.0
Nacogdoches	87	34	61.8	5.79	
Panter				1.73	
Paris *a*	90	22	60.4	2.35	
Port Lavaca	83	47	68.4	2.83	
Rhineland	92	28	63.2	0.77	
Rockisland	87	41	64.0	2.19	
Rockport *[1]	81	55	69.8		
Runge	93	41	68.7	1.14	
Saginaw *[1]	91	39	62.1	2.54	
Sanderson	90	34	64.0	T.	
Sherman	86	35	61.4	1.27	
Sugarland	89	40	66.0	1.45	
Sulphur Springs	87	36	62.0	2.29	
Temple *a*	89	38	64.4	1.52	
Temple *b*	88	35	63.2	1.91	
Trinity	89	37	63.8	2.37	
Victoria				2.43	
Waco	88	39	61.6	2.89	
Waxahachie	94	32	63.8	1.60	
Weatherford	91	36	61.7	2.20	
Wichita Falls				1.10	
Utah.					
Aneth	84	19	54.4	0.18	
Blackrock	79	13	47.1	1.29	13.0
Bluecreek *[1]	77	26	49.1	0.10	T.
Castledale	79	5	42.8	0.38	
Cisco	84	12	49.8	0.16	
Corinne	88	19	48.0	0.30	1.5
Deseret	84	19	48.1	1.02	5.0
Emery	75	11	43.8	T.	T.
Farmington	79	20	46.2	0.65	6.3
Fillmore	84	14	48.0	2.35	
Fort Duchesne	80	12	46.8	0.20	
Frisco	76	15	44.5	0.86	7.7
Giles	82	10	50.0	0.29	1.0
Government Creek	76	9	45.4	0.86	8.6
Green River	86	16	50.5	0.25	
Grover	72	11	44.2	0.45	4.5
Heber	77	16	43.9	0.31	
Henefer	77	8[h]	41.1[d]	1.51	7.5
Hite	89	28	58.6		
Huntsville				0.50	0.5
Kelton *[1]	80	27	49.4		
Lasal	72	14	43.0	0.61	9.0
Levan	77	14	46.2	1.02	6.8
Loa	71	0	36.2	0.30	3.0
Logan	75	19	45.5	1.35	
Manti	78	16	45.2	0.80	4.0
Marysvale	77[l]	17[l]	49.4[l]	0.22	1.7
Meadowville	72	12	41.0	2.22	17.5
Millville				0.94	
Minersville	80	15	46.8	0.87	5.5
Moab	89[e]	23	56.4[e]	0.75	T.
Mount Pleasant	80	17	48.4	0.13	
Ogden *a* *[1]	80	28	50.1	0.62	3.5
Park City	68	9	38.6	1.92	19.2
Parowan	77	7	45.4	1.61	16.0
Pinto	73	7	41.6	0.85	2.4
Promontory				0.17	1.8
Provo	83	19	48.0	0.29	
Richfield	72	20	45.8	0.23	2.0
St. George	88	18	54.2	0.01	
Scipio	79	14	45.9	1.07	5.0
Snowville	76	15	44.0	0.41	
Soldier Summit	82	4	38.2		6.5
Terrace *[1]	70	26	41.8	0.07	
Thistle	85	17	46.4	1.15	11.0
Tooele	79	19	48.6	1.33	
Tropic	73	6	39.3	0.30	3.0
Vernal	83	15	49.0	0.33	T.
Wellington	80	9	44.6	0.20	0.5
Vermont.					
Bennington	81	25	46.2	4.60	1.1
Burlington	72	28	46.5	3.11	1.5

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Vermont—Cont'd.					
Chelsea	76	23	43.2	2.42	4.0
Cornwall	78	26	46.2	3.15	T.
Enosburg Falls	78	20	46.3	2.72	2.0
Hartland	83	22	44.7	3.84	T.
Manchester	79	25	44.9	5.30	2.3
Norwich	83	24	45.5	3.48	T.
St. Johnsbury	77	24	46.8	1.74	3.0
Vernon*[6]	75	30	46.4	6.17	
Wells	74	24	44.0	2.89	4.0
Woodstock	80	20	44.2	5.23	
Virginia.					
Alexandria	88	36	51.6	5.44	
Ashland	86	34	53.8	5.66	
Barboursville	.....	34	.....	7.46	T.
Bedford	89	33	52.8	6.13	
Bigstone Gap	86	29	49.0	5.25	10.0
Birdsnest[2]	.....	.....	47.1	3.45	
Blacksburg	82	25	45.2	5.88	6.0
Bon Air	83	34	51.8	5.63	
Burkes Garden	77	21	42.4	8.17	17.0
Callaville	81	34	53.2	5.61	
Charlottesville	87	34	51.8	9.05	T.
Christiansburg	.....	.....	.....	7.31	
Clarksville	.....	.....	.....	4.30	T.
Cliftonforge	75	30	46.4	4.96	T.
Columbia	89	28	51.4	6.70	
Dale Enterprise	84	26	46.7	5.78	4.0
Danville	.....	.....	.....	4.90	.....
Doswell	87	25	53.3	4.78	
Farmville	88	33	53.6	6.00	
Fontella	92	34	52.0	8.38	
Fredericksburg	85	36	51.8	6.34	T.
Grahams Forge	83[i]	29[i]	47.4[i]	6.87	1.0
Hampton	74	36	51.6	4.12	
Hot Springs	82	24	44.6	8.26	7.0
Lexington	83	27	49.1	5.40	T.
Lincoln	89	30	47.6	7.55	
Manassas	84	35	50.7	5.65	
Marion	84[e]	25[f]	48.4[e]	6.82	12.0
Newport News	70[c]	40	53.0[c]	1.90	
Petersburg	85	33	52.1	5.00	
Quantico	81	28	51.0	.....	
Radford	.....	.....	.....	4.99	2.0
Rockymount	.....	.....	.....	7.52	
Salem	.....	.....	.....	6.31	.....
Speers Ferry	.....	.....	.....	5.23	16.0
Spottsville	85	31	51.8	6.53	
Stanardsville	70	27	50.5	6.52	
Staunton	88	30	50.0	8.42	T.
Stephens City	90	31	50.5	6.04	1.0
Warsaw	82	34	50.5	5.22	
Williamsburg	79	36	51.4	5.66	
Woodstock	80	30	47.0	5.57	1.0
Wytheville	84	27	47.0	9.10	6.0
Washington.					
Aberdeen	67	.....	.....	11.19	T.
Anacortes	.....	.....	.....	2.87	
Ashford	.....	.....	.....	5.84	15.2
Bremerton	70	29	47.4	5.38	T
Brinnon	66	32	46.3	5.28	1.5
Cedonia	67	20	42.1	1.15	4.3
Centerville	65	24	42.6	0.31	T
Cheney	.....	.....	.....	1.42	2.0
Clearwater	65	31	44.6	13.42	T.
Cle Elum	70	22	43.0	1.33	4.0
Colfax	73	21	47.2	1.45	2.3
Colville	71	21	42.8	1.00	0.1
Conconully	69	20	43.7	0.50	
Connell	.....	.....	.....	0.05	
Coupeville	63	31	46.1	2.58	T.
Crescent	67	22	43.1	1.02	1.0
Dayton	70	25	46.4	0.87	
Ellensburg	73	19	44.9	0.32	
Ellensburg (near)	70	16	45.8	0.15	
Grandmound	72	25	48.0	6.22	
Granite Falls	.....	.....	.....	4.81	
Hooper	71	25	47.8	0.67	T.
Issaquah	.....	.....	.....	7.10	
Lacenter	71	30	47.2	4.27	0.5
Lind	75	20	47.4	0.31	0.2
Loomis	79	26	51.8	.....	
Mayfield	67	27	41.2	5.84	0.5
Monte Cristo	63	19	39.7	9.45	64.5
Mottinger Ranch	73	30	51.8	0.03	
Mount Pleasant	69	31	47.4	3.70	0.5
Moxee Valley	74	19	46.8	0.11	
Northport	73	30	46.8	0.50	0.3
Olga	64	31	45.6	4.04	1.0
Olympia	71	29	47.2	7.24	
Pasco	79	24	52.9	T.	
Pinehill	74	27	49.0	0.97	T.
Port Townsend	64	34	46.9	1.90	T.
Pullman	68	26	44.7	0.90	1.5
Republic	68	11	41.0	2.14	4.0
Ritzville	.....	.....	.....	0.14	0.5
Rosalia	67	25	43.6	1.47	5.0
Washington—Cont'd.					
Sedro	72	25	46.8	3.30	
Silvana	67	28	45.4	3.09	
Snohomish	72	28	47.1	3.54	
Snoqualmie	69[a]	29[a]	48.0[a]	5.60	T
Southbend	70	28	45.8	11.40	
Sprague	.....	.....	.....	2.15	
Stampede	.....	.....	.....	9.30	37.0
Sunnyside	74	19	48.4	0.11	
Twin	62	29	43.3	7.07	T.
Union	72	27	46.4	9.61	3.0
Usk	73	22	42.2	.....	.....
Vancouver	70	29	48.6	3.36	
Vashon	67	31	46.8	5.49	T.
Waterville	70	25	44.0	0.68	
Wenatchee (near)	67	24	46.0	0.40	T.
West Sound	64	28	44.7	2.94	T.
Whatcom	62	27	46.6	4.49	
Wilbur	73	18	42.2	0.37	2.0
West Virginia.					
Beckley	76	30	45.5	5.78	13.0
Beverly	84	20	44.6	4.95	22.0
Bluefield	81	23	46.0	8.28	8.0
Buckhannon	81	21	47.2	6.86	11.0
Burlington	86	23	48.0	5.46	3.0
Byrne	87	27	50.6	7.33	8.0
Camden	84	26	50.4	9.77	2.8
Central	85	21	46.4	8.86	9.0
Chapel	82	26	47.4	12.07	6.2
Charleston	.....	.....	.....	6.85	.....
Clay	90	22	48.8	10.70	.....
Creston	84	22	47.2	9.87	10.0
Dayton	84	20	45.8	7.48	.....
Elkhorn	83	27	48.1	5.89	15.4
Fairmont	.....	.....	.....	6.68	1.0
Glenville	85	23	47.6	8.76	6.5
Grafton	81	23	44.8	6.51	11.0
Green Sulphur	80	28	45.0	7.27	.....
Harpers Ferry	.....	.....	.....	7.96	1.0
Hinton *a*	.....	.....	.....	6.85	5.0
Hinton *b*	84	28	48.3	.....	.....
Huntington	87	30	49.0	8.53	4.0
Josiah	87	22	47.4	6.91	18.0
Lewisburg	81	25	45.8	5.04	4.5
Magnolia	89	25	51.0	6.04	4.0
Mannington	86	23	48.0	8.55	3.0
Marlinton	79	21	43.1	6.13	4.5
Martinsburg	83	31	48.3	6.75	
Morgantown	82	26	46.5	6.15	6.0
Moscow	83	24	46.8	8.30	3.0
New Martinsville	88	25	49.4	6.31	1.0
Nuttallburg	84	22	46.0	6.77	12.0
Oceana	85	28	47.0	6.07	.....
Oldfields	86	26	49.2	5.85	T.
Philippi *a*	85	18	43.6	7.03	8.0
Point Pleasant	95	27	50.3	6.91	3.0
Powellton	87	29	48.4	7.47	10.0
Princeton	79	27	46.6	10.25	10.5
Romney	84	25	46.8	6.21	4.0
Rowlesburg	.....	.....	.....	5.02	12.0
Southside	84	31	50.8	6.81	5.2
Spencer	87	22	49.1	8.83	6.0
Uppertract	85	23	46.9	6.55	4.5
Wellsburg	79	25	45.6	8.24	7.5
Weston *a*	.....	.....	.....	7.84	5.6
Weston *b*	86	24	48.1	.....	.....
Wheeling *a*	.....	.....	.....	9.01	.....
Wheeling *b*	85	30	51.6	8.73	T.
Williamson	88	31	51.6	5.30	4.0
Winfield	83	28	49.0	7.89	3.5
Wisconsin.					
Amherst	85	12	46.3	1.06	
Appleton	81	25	45.8	0.20	T.
Ashland	.....	.....	.....	1.36	0.7
Barron	84	18	46.6	2.22	T.
Bayfield	82	18	40.5	0.05	0.5
Beloit	82	25	48.1	0.45	T.
Brodhead	88	24	47.9	0.75	T.
Butternut	82	14	43.4	1.45	3.0
Chilton[f]	85	21	49.3	0.20	.....
Citypoint	89	20	50.7	1.12	
Darlington	88	19	47.6	0.85	
Dodgeville	86	22	47.6	0.95	
Easton	87	21	48.0	0.40	
Eau Claire	88	22	49.7	1.45	
Florence	82	15	43.6	0.72	
Fond du Lac	87	22	46.4	0.24	T.
Grand River Locks	.....	.....	.....	0.49	
Grantsburg	83	15	45.4	1.65	
Hartland	84	24	46.6	0.49	
Harvey	87	26	47.8	0.71	T.
Hayward	84	15	46.2	1.85	T.
Hillsboro	86	19	46.6	0.99	T.
Koepenick	.....	.....	.....	0.40	
Ladysmith	82[e]	15	46.8[e]	1.28	
Lancaster	86	23	47.8	1.07	
Madison	82	27	47.0	0.45	
Wisconsin—Cont'd.					
Manitowoc	85	25	43.7	0.76	1.0
Meadow Valley	89	21	47.4	1.07	
Medford	85	14	44.6	0.45	
Menasha	.....	.....	.....	0.22	
Neillsville	86	20	47.4	0.92	
New London	87	24	47.4	0.56	
North Crandon	81	15	43.6	0.90	T.
Oconto	85	24	46.6	0.71	2.0
Osceola	84	16	46.0	1.51	T.
Oshkosh	83	28	46.8	1.05	
Pepin	84	18	49.9	1.34	
Pine River	90	20	47.0	0.67	
Portage	89	24	48.9	0.49	
Port Washington	74	23	44.9	0.60	0.5
Prairie du Chien *a*	90	25	50.5	1.02	T.
Prairie du Chien *b*	.....	.....	.....	1.12	.....
Prentice	81	16	45.9	0.90	T.
Racine	86	25	47.0	0.33	
Shawano	87	22	46.8	1.33	T.
Sheboygan	86	27	44.2	0.43	T.
Spooner	82	12	45.2	1.31	
Stevens Point	87[b]	22[e]	50.6[g]	0.90	
Valley Junction	88	20	47.8	1.06	
Viroqua	84	24	48.6	1.63	T.
Watertown	85	22	46.4	0.57	
Waukesha	85	27	46.4	0.35	T.
Waupaca	86	20	47.0	0.89	
Wausaukee	86[b]	20[d]	43.4[c]	0.80	T.
Westfield	86	23	47.2	0.60	
Whitehall	86	20	48.8	1.38	
Wyoming.					
Alcova	88	12	45.8	1.03	19.0
Basin	.....	.....	.....	0.36	0.9
Bedford	74	5	37.8	1.81	18.1
Bigpiney	71[d]	−2[d]	32.8[d]	0.90	9.0
Bitter Creek	68	2	36.8	1.00	10.0
Buffalo	82[c]	19[c]	45.4[c]	1.10	12.8
Casper	82	10	44.6	2.04	T.
Centennial	69	−15	34.5	2.19	21.2
Chugwater	80	5	42.0	2.26	22.0
Cody	84	20	47.4	0.02	
Daniel	69	−10	30.7	0.70	7.0
Embar	83	10	42.2	.....	.....
Evanston	68	4	36.4	1.28	8.7
Fort Laramie	83	13	45.0	3.48	T.
Fort Washakie	82	11	41.4	3.10	31.0
Fort Yellowstone	70	7	35.6	1.08	7.8
Fourbear	73	8	36.3	0.67	14.3
Griggs	82	15	43.8	1.63	T.
Iron Mountain	79	8	40.2	1.20	.....
Laramie	70	0	34.9	0.28	2.8
Lovell	80	17	39.7	0.00	
Lusk	83	13	42.4	.....	.....
Myersville	73	1	36.0	.....	.....
Parkman	83	17	42.0	1.34	9.7
Pinebluff	81	13	44.2	1.45	13.0
Rawlins	73	9	39.7	0.90	9.0
Rocksprings	74	10	41.2	.....	.....
Saratoga	74	6	41.2	0.76	5.5
Sheridan	85	20	45.3	0.98	2.0
South Pass City	66	3	34.2	2.57	25.7
Thermopolis	84	19	46.4	2.63	22.0
Wheatland	81	18	48.4	1.27	3.0
Cuba.					
Aguacate	94	46	70.6	0.83	
Alvarez	.....	.....	.....	1.25	
Australia	92	49	73.6	0.69	
Banaguises	92	51	73.5	1.45	
Batabano	88	56	73.5	0.17	
Camajuani	92	51	71.0	0.57	
Cruces	.....	.....	.....	0.43	
Gibara	96	56	75.0	0.20	
Guabairo	.....	.....	.....	0.17	
Guanajay	87	59	72.9	0.90	
Guantanamo	92	57	76.7	0.13	
Guines	92	.....	.....	0.00	
Holguin	98	59	76.0	.....	
Isabel, Guantanamo	.....	.....	.....	0.17	
Los Canos	94	53	76.4	0.30	
Manzanillo	94	65	82.2	T.	
Matanzas	94	42	70.8	1.33	
Moron Trocha	96	55	74.8	0.65	
Nuevitas	96	62	80.8	0.94	
Pinar del Rio	90	55	74.0	2.55	
Romelie, Guantanamo	.....	.....	.....	0.47	
Sagua La Grande[j]	91	55	76.5	0.36	
San Ceyetano	96	55	74.8	1.20	
Santa Clara	92	50	72.8	0.06	
Sancti Spiritus	89	60	74.0	0.45	
Santa Cruz del Sur	89	58	74.0	0.40	
Soledad	90	53	72.8	0.28	
Soledad, Guantanamo	94	53	75.6	0.34	
Union de Reyes	90	50	75.2	0.70	
Yaguajay	.....	.....	.....	0.48	
Yateras	.....	.....	.....	0.50	

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TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Porto Rico.	°	°	°	*Ins.*	*Ins.*
Adjuntas	89	......	......	0.76	
Aguadilla	92	67	79.2	8.43	
Aguirre	91	65	78.8	0.67	
Arecibo	89	63	76.1	7.68	
Barros	83	58	69.6	0.51	
Bayamon	97	61	79.0	1.37	
Caguas	89	62	76.2	....	
Canovanas	92	68	79.7	0.41	
Cayey	97	57	75.9	1.33	
Cidra	92	54	74.6	1.25	
Coamo	94	60	78.0	1.45	
Comerio	93	58	76.0	0.21	
Corozal	95	58	76.6	2.75	
Fajardo	93	67	80.0	3.03	
Guayama	......	......	......	2.18	
Hacienda Amistad	93	60	77.3	0.32	
Hacienda Coloso	92	59	76.9	6.54	
Hacienda Perla	92	67	78.9	5.56	
Humacao	89	61	75.6	2.04	
Isabela	92	65	77.0	8.68	
Juana Diaz	92	66	79.4	1.91	
La Isolina	89	61	74.6	7.08	
Manati	94	59	78.0	5.44	
Maunabo	89	68	80.5	1.78	
Mayaguez	94	62	79.0	3.90	
Morovis	95	62	75.5	6.04	
Ponce	93	67	79.8	0.39	
Salinas	......	......	......	1.33	
San Lorenzo	93	60	77.6	0.86	
Santurce	......	......	......	0.66	
Utuado	94	59	78.4	5.84	
Vieques	91	72	81.4	2.55	
Yauco	87	66	77.6	0.73	
Mexico.					
Ciudad P. Diaz	92	44	71.4	5.46	
Coatzacoalcos	100	57	76.2	2.25	
Leon de Aldamas	89	46	68.2	0.03	
Puebla	84	50	65.8	0.40	
Tampico	90	60	75.9	0.20	
Vera Cruz	89	66	77.6	0.00	
New Brunswick.					
St. John	63	30	43.3	3.41	
Isthmus of Panama.					
Alhajuela	......	......	......	2.52	
La Boca	95	75	82.9	....	

Late reports for March, 1901.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Demopolis	......	......	......	5.17	
Alaska.					
Coal Harbor	48	7	27.6	1.98	11.2
Fort Liscum	52	10	30.8	6.38	95.6
Fort Yukon	25	—41	1.6	0.38	......
Juneau	48	16	36.2	8.23	1.0
Kenai	50	—21	28.4	0.32	4.0
Alaska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Orca	50	11	34.6	16.91	39.0
Sitka	58	27	44.6	7.17	......
Tyoonok	46	— 3	29.4	0.62	7.5
Wood Island	54	5	34.9	3.85	8.5
Arizona.					
Silver King	......	......	....	1.34	
California.					
Goshen	......	......	......	0.22	
Ke nville	......	......	......	0.15	
Lemoore *[1]	76	32	54.8	0.08	
Mutah	......	......	......	0.25	
Reedley	78	32	57.7	......	
San Miguel Island	87	40	56.7	0.20	
Tulare *b*	......	......	......	0.25	
District of Columbia.					
Receiving Reservoir *[5]	72	12	44.2	2.05	
Florida.					
Brooksville	86	30	60.6	4.38	
Idaho.					
Payette	70	20	42.8	0.98	0.2
Illinois					
Shobonier	73	9	43.0	3.21	T.
Indiana.					
Madison *b*	......	......	......	3.90	3.0
Iowa.					
St. Charles	68	7	36.7	3.72	11.8
Kansas.					
Columbus	78	9	44.2	4.54	1.5
Hays	88	5	39.4	1.25	2.0
Pratt	86	10	44.4	0.66	T.
Kentucky.					
Franklin	80	13	50.8	3.00	T.
Henderson	78	13	46.6	3.78	T.
Maryland.					
Smithsburg *a*	74	5	43.1	3.39	T.
Michigan.					
Midland	....	......	......	0.83	8 0
Plymouth	.....	......	......	1.02	T.
Mississippi.					
Austin	81	19	54.0	1.59	
Nebraska.					
Grand Island *a*	......	......	......	2.03	12.0
Guide Rock	......	......	.....	2.30	14.5
Nevada					
Palmetto	70	10	38.4	1.40	14.0
New Jersey.					
Mount Pleasant	......	......	......	2.40	0.1
North Dakota.					
Buxton	......	—10	......	0.75	1.3
Churchs Ferry	43	—16	18.8	0.18	0.6
Fort Yates	69	— 5	30.0	0.79	4.8
Ohio.					
Portsmouth *b*	84	5	43.6	1.52	1.1
Willoughby	.....	......	......	3.99	3.0
Pennsylvania.					
Forks of Nesh miny *[1]	54	13	38.4	6.23	T.
South Dakota.					
Gray	65	— 6	35.2	0.97	12.5
Texas.	°	°	°	*Ins.*	*Ins.*
Fort Brown	96	36	67.4	0.00	
Valentine	86	26	55.2	2.00	
Victoria	......	......	.....	0.45	
Virginia.					
Mana sas	74	11	46.1	....	
Washington.					
Ritzville	......	......	......	0.06	
Sedro	67	27	43.9	4.17	
West Sound [5]	59	24	42.6	1.51	
Wisconsin.					
Citypoint	52	—12	27.3	1.99	16.0
Mexico.					
Coatzacoalcos	94	52	73.5	2.55	

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.
[7] Mean from hourly readings of thermograph.
[9] Mean of sunrise and noon.
[10] Mean of sunrise, noon, sunset, and midnight.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance "n" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

March, 1901, page 138, under head of "Late reports for February," make total precipitation at Laurel, Md., read 0.62 instead of 0.90.

March, 1901, Potosi, Mo., make mean temperature read 41.9 instead of 40.8; Philippi, W. Va., make mean temperature 41.0 instead of 42.0.

NOTE.—The following changes have been made in the names of stations; Utah, Holyoake, changed to Aneth.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of April, 1901.*

Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.
	Hours.	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
New England.						
Eastport, Me	22	12	36	3	n. 73 e.	34
Portland, Me	38	8	22	9	n. 23 e.	33
Northfield, Vt	32	21	12	1	n. 45 e.	16
Boston, Mass	33	4	33	2	n. 47 e.	42
Nantucket, Mass	28	11	30	10	n. 50 e.	26
Block Island, R. I	23	10	33	8	n. 63 e.	28
New Haven, Conn	35	10	23	4	n. 37 e.	31
Middle Atlantic States.						
Albany, N. Y	35	11	7	15	n. 18 w.	25
Binghamton, N. Y †	17	5	12	7	n. 23 e.	13
New York, N. Y	29	10	27	11	n. 40 e.	25
Harrisburg, Pa †	17	2	10	8	n. 8 e.	15
Philadelphia, Pa	30	10	22	13	n. 24 e.	22
Scranton, Pa	29	10	29	7	n. 49 e.	29
Atlantic City, N. J	27	14	13	14	n. 35 e.	16
Cape May, N. J	27	12	22	14	n. 28 e.	17
Baltimore, Md	28	9	24	12	n. 32 e.	22
Washington, D. C	29	9	19	15	n. 11 e.	20
Lynchburg, Va	21	8	19	25	n. 25 w.	14
Norfolk, Va	24	14	17	18	n. 6 w.	10
Richmond, Va	31	14	14	12	n. 7 e.	17
South Atlantic States.						
Charlotte, N. C	26	13	18	21	n. 13 w.	13
Hatteras, N. C	29	11	10	22	n. 34 w.	22
Raleigh, N. C	30	7	14	22	n. 19 w.	24
Wilmington, N. C	24	7	14	26	n. 35 w.	21
Charleston, S. C	22	11	13	27	n. 52 w.	18
Augusta, Ga	30	8	12	27	n. 34 w.	27
Savannah, Ga	21	15	11	25	n. 67 w.	15
Jacksonville, Fla	24	10	18	24	n. 23 w.	15
Florida Peninsula.						
Jupiter, Fla	16	9	15	29	n. 63 w.	16
Key West, Fla	30	6	22	18	n. 9 e.	28
Tampa, Fla	20	8	8	30	n. 61 w.	25
Eastern Gulf States.						
Atlanta, Ga	23	12	17	27	n. 42 w	15
Macon, Ga †	13	5	7	13	n. 37 w.	10
Pensacola, Fla †	20	3	9	9	n.	17
Mobile, Ala	30	15	10	21	n. 36 w.	19
Montgomery, Ala	24	12	16	20	n. 18 w.	13
Meridian, Miss †	16	13	9	10	n. 4 w.	13
Vicksburg, Miss	21	13	25	13	n. 56 e.	14
New Orleans, La	23	18	17	19	n. 22 w.	5
Western Gulf States.						
Shreveport, La	15	11	25	19	n. 56 e.	7
Fort Smith, Ark	16	8	29	17	n. 56 e.	14
Little Rock, Ark	25	11	22	19	n. 12 e.	14
Corpus Christi, Tex	9	31	31	7	s. 48 w.	33
Fort Worth, Tex	15	25	21	13	s. 39 e.	13
Galveston, Tex	14	22	28	16	s 56 e.	14
Palestine, Tex	17	23	16	15	s. 9 e	6
San Antonio, Tex	16	21	32	8	s. 78 e.	24
Ohio Valley and Tennessee.						
Chattanooga, Tenn	25	12	16	22	n. 25 w.	14
Knoxville, Tenn	28	13	16	21	n. 18 w.	16
Memphis, Tenn	26	11	24	15	n. 31 e	18
Nashville, Tenn	35	7	13	24	n. 22 w.	30
Lexington, Ky †	12	6	11	9	n. 18 e.	6
Louisville, Ky	31	5	17	17	n.	26
Evansville, Ind †	18	4	10	6	n 16 e.	15
Indianapolis, Ind	34	6	20	15	n. 10 e.	28
Cincinnati, Ohio	30	7	18	20	n. 5 w.	23
Columbus, Ohio	29	5	21	17	n. 9 e.	24
Pittsburg, Pa	32	11	14	24	n. 25 w.	23
Parkersburg, W. Va	32	6	16	19	n. 7 w.	26
Elkins, W. Va	28	10	13	21	n. 24 w	20
Lower Lake Region.						
Buffalo, N. Y	26	13	25	13	n. 43 e	18
Oswego, N. Y	30	12	24	13	n. 31 e.	21
Rochester, N. Y	27	10	20	19	n. 3 e	17
Erie, Pa	25	9	15	21	n 17 w.	17
Cleveland, Ohio	30	10	17	17	n.	20
Sandusky, Ohio	29	6	26	9	n. 36 e.	29
Toledo, Ohio	29	6	25	10	n. 33 e.	28
Detroit, Mich	36	10	20	5	n. 30 e	30
Upper Lake Region.						
Alpena, Mich	36	10	20	9	n 23 e.	28
Escanaba, Mich	41	12	9	8	n. 2 e.	29
Grand Haven, Mich	29	9	20	13	n. 19 e.	21
Houghton, Mich. †	4	5	16	10	s. 80 e.	6
Marquette, Mich	26	12	9	32	n 59 w.	27
Port Huron, Mich	43	8	18	4	n. 22 e.	38
Sault Ste. Marie, Mich	17	11	16	29	n. 65 w.	14
Chicago, Ill	22	8	30	5	n. 61 e.	29
Milwaukee, Wis	36	8	26	7	n 34 e.	34
Green Bay, Wis	38	9	13	6	n. 14 e.	30
Duluth, Minn	37	3	33	6	n. 39 e.	43
North Dakota.						
Moorhead, Minn	16	27	30	8	s. 64 e.	25
Bismarck, N. Dak	19	16	32	8	n. 84 e.	24
Williston, N. Dak	19	29	14	5	s. 42 e.	14
Upper Mississippi Valley.						
St. Paul, Minn	22	20	26	10	n. 83 e.	16
Upper Mississippi Valley.—Cont'd.						
La Crosse, Wis †	14	12	8	2	n. 72 e.	6
Davenport, Iowa	26	9	29	12	n. 45 e.	24
Des Moines, Iowa	19	25	26	4	s. 75 e.	23
Dubuque, Iowa	23	13	29	13	n. 58 e.	19
Keokuk, Iowa	25	12	26	10	n. 51 e.	21
Cairo, Ill	30	7	26	13	n. 29 e.	26
Springfield, Ill	24	18	26	7	n. 72 e.	20
Hannibal, Mo †	14	5	14	7	n. 38 e.	11
St. Louis, Mo	23	10	28	8	n. 77 e.	24
Missouri Valley.						
Columbia, Mo*	11	3	17	5	n. 56 e.	14
Kansas City, Mo	21	17	24	9	n. 75 e.	14
Springfield, Mo	19	22	25	13	s. 76 e.	12
Lincoln, Nebr	18	23	26	5	s. 77 e	22
Omaha, Nebr	17	16	28	7	n. 87 e.	21
Valentine, Nebr	16	29	15	8	s. 28 e	15
Sioux City, Iowa †	11	9	16	4	n. 81 e.	12
Pierre, S. Dak	14	23	29	5	s. 69 e.	26
Huron, S. Dak	13	22	30	9	s. 67 e.	23
Yankton, S. Dak †	7	9	15	4	s. 80 e.	11
Northern Slope.						
Havre, Mont	17	11	17	27	n. 59 w.	12
Miles City, Mont	23	23	18	10	e.	8
Helena, Mont	5	26	5	38	s. 57 w.	39
Kalispell, Mont	14	18	10	31	s. 79 w.	21
Rapid City, S. Dak	18	17	18	19	n. 45 w.	1
Cheyenne, Wyo	23	19	5	24	n. 78 w.	19
Lander, Wyo	15	23	9	29	s. 68 w.	22
North Platte, Nebr	12	24	26	12	s. 49 e.	18
Middle Slope.						
Denver, Colo	19	23	15	16	s. 14 w.	4
Pueblo, Colo	23	13	13	22	n. 42 w.	14
Concordia, Kans	18	22	26	6	s. 79 e.	20
Dodge, Kans	17	23	27	13	s. 67 e	15
Wichita, Kans	15	30	20	5	s. 45 e.	21
Oklahoma, Okla	15	22	26	7	s. 70 e	20
Southern Slope.						
Abilene, Tex	8	32	25	10	s. 32 e.	28
Amarillo, Tex	11	32	18	16	s. 5 e.	21
Southern Plateau.						
El Paso, Tex	16	11	17	30	n. 69 w.	14
Santa Fe, N. Mex	15	24	23	11	s. 53 e.	15
Flagstaff, Ariz	20	16	7	28	n. 79 w.	21
Phoenix, Ariz	13	11	27	22	n. 68 e.	5
Yuma, Ariz	16	17	11	26	s. 86 w.	15
Independence, Cal	24	21	12	18	n. 63 w.	7
Middle Plateau.						
Carson City, Nev	16	16	6	32	w.	26
Winnemucca, Nev	18	13	11	30	n. 75 w.	20
Modena, Utah	16	20	11	30	s. 78 w.	19
Salt Lake City, Utah	21	22	19	11	s. 86 e.	15
Grand Junction, Colo	16	22	22	19	s. 27 e.	7
Northern Plateau.						
Baker City, Oreg	18	28	16	14	s. 11 e.	10
Boise, Idaho	23	16	16	22	n. 41 w.	9
Lewiston, Idaho †	2	4	21	5	s. 83 e.	16
Pocatello, Idaho	13	19	9	27	s. 72 w.	19
Spokane, Wash	8	31	13	20	s. 17 w.	24
Walla Walla, Wash	8	42	7	12	s. 8 w.	34
North Pacific Coast Region.						
Astoria, Oreg	18	17	8	33	n. 88 w	25
Neah Bay, Wash	6	22	14	35	s. 53 w.	26
Port Crescent, Wash *	1	6	12	15	s. 31 w.	6
Seattle, Wash	11	25	20	19	s. 4 e.	14
Tacoma, Wash	21	23	7	20	s. 81 w.	13
Portland, Oreg	17	24	8	25	s. 68 w.	18
Roseburg, Oreg	25	16	11	19	n. 42 w.	12
Middle Pacific Coast Region.						
Eureka, Cal	20	20	14	24	w.	10
Mount Tamalpais, Cal	25	7	4	39	n. 63 w.	39
Red Bluff, Cal	26	17	14	17	n. 18 w.	10
Sacramento, Cal	17	31	10	19	s. 33 w.	17
San Francisco, Cal	6	17	1	43	s. 75 w.	43
South Pacific Coast Region.						
Fresno, Cal	37	2	4	37	n. 43 w.	48
Los Angeles, Cal	14	9	12	32	n. 76 w.	21
San Diego, Cal	20	10	15	29	n. 54 w.	17
San Luis Obispo, Cal	22	9	1	31	n. 57 w.	33
West Indies.						
Basseterre, St. Kitts Island	16	9	41	3	n. 80 e.	39
Bridgetown, Barbados	7	14	53	1	s. 83 e.	52
Cienfuegos, Cuba	......	......	......	......	......	......
Grand Turk, Turks Island, W. I †	11	10	14	2	n. 85 e.	12
Havana, Cuba	24	7	23	13	n. 30 e.	20
Kingston, Jamaica	42	8	11	6	n. 8 e.	34
Port of Spain, Trinidad	5	4	56	0	n. 89 e.	56
Puerto Principe, Cuba	31	9	33	6	n. 51 e.	35
Roseau, Dominica, W. I	12	12	55	12	s.	23
San Juan, Porto Rico	9	25	37	2	s. 65 e.	38
Santiago de Cuba, Cuba	31	18	18	5	s. 45 e.	18
Santo Domingo, S. Domingo, W. I.	......	......	......	......	......	......
Willemstad, Curaçao	1	4	58	0	s. 87 e.	58

* From observations at 8 p. m. only.

† From observations at 8 a. m. only.

TABLE IV.—*Thunderstorms and auroras, April, 1901.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	52	T.	5	4										2	1	1			4	5	1						2			2	1			28	11	T.
		A.																																0	0	A.
Arizona	56	T.	1			1							3				1	3				3	1	1										14	8	T.
		A.																																0	0	A.
Arkansas	57	T.	6				1					2	3	13	4		1	1	14							1	7	4	4					61	13	T.
		A.																																0	0	A.
California	167	T.	1	2	4		1	1			2																							11	6	T.
		A.																																0	0	A.
Colorado	81	T.				4			1	7	10	9	4	3	5		9	2					2	9	13	1	1		4	5	2	2		93	19	T.
		A.																																0	0	A.
Connecticut	21	T.																						4	1									5	2	T.
		A.																																0	0	A.
Delaware	5	T.																			1													1	1	T.
		A.																																0	0	A.
Dist. of Columbia	4	T.																																0	0	T.
		A.																																0	0	A.
Florida	47	T.		2											2				1	4	2	1									1	2		15	10	T.
		A.																																0	0	A.
Georgia	55	T.	4	9											3					1	1								2	2				22	7	T.
		A.																																0	0	A.
Idaho	34	T.		2	1																				1		1	1						6	5	T.
		A.																																0	0	A.
Illinois	92	T.					5							2	2			3	2															14	5	T.
		A.										1			1	1		1	1															5	5	A.
Indiana	58	T.		2				1							1			2	4															10	5	T.
		A.																																0	0	A.
Indian Territory	11	T.	2			1	3				1	5	3	1	1		1	2	2							1			3					26	13	T.
		A.																																0	0	A.
Iowa	149	T.			1		5						2	1	1		2	18	1										20	3				54	11	T.
		A.																																0	0	A.
Kansas	77	T.	1	1		5	10			4	4	14	13	13	4		5	2								8		6	6	6				102	16	T.
		A.																																0	0	A.
Kentucky	41	T.					4	1							1				8															14	4	T.
		A.																																0	0	A.
Louisiana	46	T.											1	9	2			4	14	9	2	1					1	2	2	2				49	12	T.
		A.																																0	0	A.
Maine	19	T.																																0	0	T.
		A.																											1	1				2	2	A.
Maryland	48	T.														2			1	1			1											5	4	T.
		A.																																0	0	A.
Massachusetts	48	T.																																0	0	T.
		A.																																0	0	A.
Michigan	106	T.														1								1						2	4			8	4	T.
		A.																			1													1	1	A.
Minnesota	67	T.		1														1						1		1	1	5	13	16	11	8		58	10	T.
		A.																																0	0	A.
Mississippi	41	T.	4										1	5	1				12	4							7	5	8	6				53	10	T.
		A.																																0	0	A.
Missouri	95	T.	2		1	1	17	1			1		2	27	6		4	23	4	2	1					6	9	6	11	1				126	19	T.
		A.																																0	0	A.
Montana	40	T.		1																1							1					1		4	4	T.
		A.																																0	0	A.
Nebraska	142	T.				2				1	1			1	1		10	21					1		3	1	1	8	12	6	2			71	17	T.
		A.																1	1											1	1	1		5	5	A.
Nevada	40	T.														3																		3	1	T.
		A.																																0	0	A.
New Hampshire	19	T.																																0	0	T.
		A.																																0	0	A.
New Jersey	51	T.														1				1		5	1											8	4	T.
		A.																																0	0	A.
New Mexico	31	T.	1							2	1	1				1		1					2	1	5	1			2	7	5	1		31	14	T.
		A.																																0	0	A.
New York	99	T.																				1	2	17	1							3		24	5	T.
		A.										1						1																2	2	A.
North Carolina	56	T.	1	7	5			1							1						4													19	6	T.
		A.																																0	0	A.
North Dakota	48	T.																					1		1	3	6	8	1	4				24	7	T.
		A.																					1											1	1	A.
Ohio	128	T.													1								1			1								3	3	T.
		A.																																0	0	A.
Oklahoma	23	T.	1	1		1	3			1	1	8	10				1		1							2		3	3	2				38	14	T.
		A.																																0	0	A.
Oregon	74	T.		1																						1	3	1			6	5		17	6	T.
		A.																																0	0	A.
Pennsylvania	91	T.	1																				1											2	2	T.
		A.																			1													1	1	A.
Rhode Island	7	T.																																0	0	T.
		A.																																0	0	A.
South Carolina	46	T.	1	9											7	1					4	1							1					24	7	T.
		A.																																0	0	A.
South Dakota	56	T.	1										1										2				3	11	2	7	1			28	8	T.
		A.		1																				1		1					1			4	4	A.
Tennessee	56	T.	10	6											1														1					18	4	T.
		A.																																0	0	A.
Texas	95	T.								1	4	3	4	4				1	10	1								1	2	1	1			33	12	T.
		A.																																0	0	A.
Utah	47	T.			2				1		3					3	4							7	1									21	7	T.
		A.																																0	0	A.
Vermont	16	T.																																0	0	T.
		A.																											1					1	1	A.
Virginia	50	T.		1				2								6	1																	10	4	T.
		A.																																0	0	A.
Washington	64	T.											1									8	1		1		6			2	4	4		27	8	T.
		A.																																0	0	A.
West Virginia	43	T.																																0	0	T.
		A.																																0	0	A.
Wisconsin	60	T.																2											2		4	6		14	4	T.
		A.																																0	0	A.
Wyoming	31	T.			1																			2	3	1						1		8	5	T.
		A.																																0	0	A.
Sums	2,893	T	42	49	15	15	49	7	2	16	28	42	48	81	45	19	39	86	78	29	16	20	16	43	30	28	49	61	100	74	42	33	....	1,202	....	T.
		A	0	1	0	0	0	0	0	0	0	2	0	0	1	1	0	3	2	0	0	2	1	1	0	1	0	0	2	2	2	1	....	22	...	A

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during April, 1901, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration. From—	Total duration. To—	Total am't of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	20-21			1.86														0.31			
Alpena, Mich.	17-18			0.62														*			
Atlanta, Ga.	12-13			2.56														0.71			
Atlantic City, N. J.	2-3			0.70														0.16			
Baltimore, Md.	2-3			1.78														0.37			
Binghamton, N. Y.	20-21			1.35														0.22			
Bismarck, N. Dak.	28			0.26														0.16			
Boise, Idaho	2-3			0.87														0.10			
Boston, Mass.	24-25			3.27														0.25			
Buffalo, N. Y.	18-20			1.69														0.16			
Cairo, Ill.	17			0.60														0.44			
Charleston, S. C.	2-3	7.02 p. m.	3.10 a. m.	0.71	7.25 p. m.	7.40 p. m.	0.02	0.17	0.32	0.42	0.43	0.43	0.45	0.50							
Chicago, Ill.	21-22			0.15														0.04			
Cincinnati, Ohio	5			0.20														0.17			
Cleveland, Ohio	17-18			0.24														0.11			
Columbia, Mo.	12-13			0.83														0.30			
Columbus, Ohio	17-18			0.28														0.12			
Denver, Colo.	10-12			1.24														*			
Des Moines, Iowa	5-6			1.08														0.20			
Detroit, Mich.	17-18			0.96														0.12			
Dodge, Kans	11			0.42														0.42			
Duluth, Minn.	30			0.69														0.35			
Eastport, Me.	23			0.95														0.22			
Elkins, W. Va	2-4			2.46														*			
Erie, Pa.	19-21			2.13														*			
Escanaba, Mich.	16-17			0.60														0.12			
Evansville, Ind	17-18			1.83														0.37			
Fort Worth, Tex.	17			0.82														0.43			
Fresno, Cal.	29-30			0.44														*			
Galveston, Tex.	12	3.45 a. m.	2.30 p. m.	2.78	10.45 a. m.	11.35 a. m.	1.53	0.11	0.22	0.35	0.45	0.52	0.55	0.59	0.67	0.75	0.80	0.87			
Grand Junction, Colo.	10-11			0.63														*			
Harrisburg, Pa	2-3			1.17														0.24			
Hatteras, N. C.	19-20			1.08														0.50			
Huron, S. Dak.	26			0.20											0.20						
Indianapolis, Ind.	17-18			1.45														0.20			
Jacksonville, Fla.	2			0.55														0.45			
Jupiter, Fla.	19	5.15 a. m.	8.50 a. m.	1.36	8.05 a. m.	8.40 a. m.	0.17	0.07	0.15	0.27	0.42	0.77	1.10	1.19							
Kalispell, Mont	26			0.32														*			
Kansas City, Mo.	5			2.02														*			
Key West, Fla.	19			0.45														0.27			
Knoxville, Tenn	1-2			1.70														0.26			
Lexington, Ky.	18-19			2.41														0.17			
Lincoln, Nebr.	16			0.53														0.22			
Little Rock, Ark.	12	8.00 p. m.	D. N.	1.53	10.10 p. m.	10.50 p. m.	0.55	0.09	0.13	0.23	0.33	0.44	0.68	0.85	0.89	0.92	0.95	0.98			
Los Angeles, Cal.	30			0.68														0.16			
Louisville, Ky.	5-6			0.50														0.45			
Macon, Ga.	2	7.15 a. m.	5.55 p. m.	2.45	9.13 a. m.	9.32 a. m.	0.22	0.12	0.27	0.53	0.63	0.63	0.64	0.69	0.73						
Memphis, Tenn.	17			0.89														0.27			
Meridian, Miss.	17-18	6.05 p. m.	D. N.	2.27	8.35 p. m.	9.25 p. m.	0.40	0.05	0.11	0.15	0.51	0.68	0.80	0.90	1.08	1.13	1.18	1.21			
Milwaukee, Wis.	16			0.18														0.10			
Montgomery, Ala.	2	12.59 a. m.	4.56 a. m.	1.78	3.40 a. m.	4.30 a. m.	0.40	0.05	0.09	0.12	0.17	0.27	0.36	0.62	1.06	1.29	1.35	1.88			
Nantucket, Mass.	15-16			1.97														0.21			
Nashville, Tenn.	1-2			2.06														0.30			
New Haven, Conn.	20-21			4.17														0.55			
New Orleans, La.	17-18	9.10 p. m.	5.20 p. m.	5.92	10.35 p. m.	11.20 p. m.	0.77	0.07	0.11	0.17	0.26	0.58	1.02	1.30	1.40	1.47					
New York, N. Y.	20-21			2.77														0.43			
Norfolk, Va.	2-3			1.85														0.36			
Northfield, Vt.	6-8			1.30														0.15			
Oklahoma, Okla.	10			0.67														0.40			
Omaha, Nebr.	16			0.40														0.23			
Parkersburg, W. Va.	18-21			4.69														0.19			
Philadelphia, Pa	2-3			1.53														0.31			
Pittsburg, Pa.	18-20			3.95														0.22			
Pocatello, Idaho	7-8			0.26														*			
Portland, Me.	6-7			1.61														0.47			
Portland, Oreg.	1			0.81														0.28			
Pueblo, Colo.	10-11			0.88														0.23			
Raleigh, N. C.	2-3			3.37														0.41			
Richmond, Va.	2-3			2.06														0.32			
Rochester, N. Y.	30			0.36														0.22			
St. Louis, Mo.	5			0.45														0.25			
St. Paul, Minn.	5-6			0.67														0.20			
Salt Lake City, Utah.	6-7			0.40														*			
San Diego, Cal.	9			0.01																	
Sandusky, Ohio	20-21			0.69														0.10			
San Francisco, Cal.	28-29			0.88														0.24			
Savannah, Ga.	19			0.74														0.42			
Seattle, Wash.	4-5			1.36														0.12			
Spokane, Wash.	4-5			0.77														*			
Tampa, Fla.	18-19			1.04														0.50			
Toledo, Ohio	17-18			0.67														0.10			
Topeka, Kans.	5			1.56														*			
Vicksburg, Miss.	17	12.05 p. m.	7.35 p. m.	1.58	5.20 p. m.	5.40 p. m.	0.54	0.17	0.59	0.70	0.74	0.76									
Washington, D. C.	2-3			2.19														0.40			
Wilmington, N. C.	2-3			0.86														0.65			
Yankton, S. Dak	28			0.51									0.51								
Basseterre, St. Kitts.	13			0.71														0.68			
Bridgetown, Barbados	26			0.89														0.78			
Cienfuegos, Cuba																					
Havana, Cuba	19			0.46														0.35			
Kingston, Jamaica	17	4.26 p. m.	4.58 p. m.	0.58	4.32 p. m.	4.50 p. m.	T.	0.19	0.44	0.54	0.58										
Port of Spain, Trin.	29			0.01														0.01			
Puerto Principe, Cuba	19-20			0.50														0.36			
Roseau, Dominica	26			0.14														0.14			
San Juan, Porto Rico.	13			0.51														0.43			
Santiago de Cuba	20			0.22														0.22			
Santo Domingo, S. D.																					
Willemstad, Curaçao				0.00																	

*Self register not working.

TABLE VI.—*Data furnished by the Canadian Meteorological Service, April, 1901.*

Stations.	Pressure.			Temperature.				Precipitation.		
	Mean not reduced.	Mean reduced.	Departure from normal.	Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Total.	Departure from normal.	Depth of snow.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
St. Johns, N. F	29.99	30.14	+.23	36.4	+ 1.9	42.2	30.5	2.42	−1.67	....
Sydney, C. B. I	30.13	30.17	+.30	38.1	+ 3.1	44.7	31.5	4.62	+0.82	12.0
Halifax, N. S	29.98	30.09	+.21	42 5	+ 4.7	49.8	35.2	6.33	+3.02	0.8
Grand Manan, N. B	30.02	30.08	+.18	41.1	+ 1.9	46.2	36.0	5.00	+1.60	....
Yarmouth, N. S	29.97	30.05	+.14	44.6	+ 5.7	52.7	36.5	4.53	+1.59	0.6
Charlottet'n, P. E. I	30.09	30.13	+.23	41.7	+ 6.5	49.8	33.6	1.15	−1.77	2.5
Chatham, N. B	30.15	30.17	+.25	39 9	+ 4.4	48.2	31.5	6.41	+3.31	8.6
Father Point, Que	30.14	30.17	+.25	35.7	+ 2.5	42.4	28.9	1.89	−0.13	0.3
Quebec, Que	29.78	30.12	+.17	40.0	+ 4.9	46.6	33.5	2.53	+0.14	2.7
Montreal, Que	29.85	30.06	+.10	44.0	+ 4.3	51.3	36.6	4.19	+1.75	1.3
Bissett, Ont	29.51	30.13	+.17	44.5	+ 6.6	57.3	31.8	1.60	+0.36	2.6
Ottawa, Ont	29.71	30.03	+.07	46.4	+ 6.4	55 8	37.1	2.99	+1.13	T.
Kingston, Ont	29.72	30.04	+.07	45.4	+ 5.4	53.1	37.6	3.59	+1.64	5.5
Toronto, Ont	29.68	30.06	+ 07	46.2	+ 5.4	54 8	37.6	3.86	+1.98	8.8
White River, Ont	28.85	30.22	+.18	37.2	+ 4.2	52.9	21.4	1.16	−0.02	0.6
Port Stanley, Ont	29.41	30.06	+.06	43.7	+ 2.7	52.6	34.9	2.73	+0.60	7.3
Saugeen, Ont	29.38	30.11	+.11	43.2	+ 4.5	51.8	34.7	1.73	−0.10	3.6
Parry Sound, Ont	29.40	30.10	+.12	45.1	+ 7.5	56.2	34.1	1.84	+0.12	1.0
Port Arthur, Ont	29.47	30 18	+.15	38.3	+ 4.8	47.6	28.9	1.57	+0.20	....
Winnipeg, Man	29.36	30.19	+.15	42.8	+ 6.9	55.4	30.2	1.93	+0.58	1.0
Minnedosa, Man	28.26	30.09	+.10	40.4	+ 4.4	51.1	29.6	1.25	+0.13	10.3
Qu'Appelle, Assin	27.74	30.03	+.06	37.6	+ 0.2	46.3	29.0	5.03	+3.97	48.4
Medicine Hat, Assin.	27.65	29.95	+.02	45.1	+ 0.6	60.1	30.1	0.11	−0.40	0.6
Swift Current, Assin.	27.40	29.99	+.02	43.6	+ 2.3	55.1	32.0	0.42	−0.76	0.2
Calgary, Alberta	26.34	29.91	−.02	38.7	− 0.9	51.6	25.9	0.90	+0.28	9.0
Banff, Alberta	25.28	29.99	+.04	34.0	− 1.3	44.2	23.7	1.57	+0.32	14.3
Edmonton, Alberta	27.58	29.90	−.03	39.8	− 0.1	51.1	28.5	1.11	+0.54	10.6
Prince Albert, Sask	28.43	29.99	+.04	38.0	+ 1.9	49.7	26.2	0.48	−0.37	T.
Battleford, Sask	28 24	30.01	+.06	38.5	+ 1.3	50.9	26.1	0 36	−0.12	3.0
Kamloops, B. C	28.72	30.00	+ 03	48.3	− 0.6	60 3	36.3	0.17	−0.33	0.2
Victoria, B. C	29.95	30.05	+.03	46.0	− 0.8	51.8	40.0	3.01	+0.48	....
Barkerville, N. W. T.	25.56	29.93	......	32.9	− 0.2	43.3	22.4	1.86	−0.11	16.0
Hamilton, Bermuda.	29.73	29.89	−.13	61.0	+ 0.1	70.0	57.9	7.20	+2.74	...

TABLE VII.—*Heights of rivers referred to zeros of gages, April, 1901.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Mississippi River.	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
St. Paul, Minn	1,954	14	7.5	12	5.4	1	6.5	2.1
Reeds Landing, Minn	1,884	12	7.1	11-14	4.6	1	6.2	2.7
La Crosse, Wis	1,819	12	8.9	14, 15, 17	7.3	3-5, 30	8.2	1.6
Prairie du Chien, Wis	1,759	18	11.0	18-20	9.1	8, 9	10.1	1.9
Dubuque, Iowa	1,699	15	11.0	20	9.3	10, 11	10.2	1.7
Leclaire, Iowa	1,609	10	7.0	21-24	6.1	11-14	6.6	0.9
Davenport, Iowa	1,593	15	8.8	1-4, 22-24	7.8	13-15	8.4	1.0
Muscatine, Iowa	1,562	16	10.9	1-3	9.6	14, 15	10.3	1.3
Galland, Iowa	1,472	8	6.1	4	4.8	16, 17	5.4	1.3
Keokuk, Iowa	1,463	15	11.0	7, 8	8.7	17, 30	9.6	2.3
Hannibal, Mo	1,402	13	12.9	8	10.0	17, 30	11.2	2.9
Grafton, Ill	1,306	23	16.6	10, 11	12.7	30	15.0	3.9
St. Louis, Mo	1,264	30	22.4	18, 19	15.4	29, 30	19.5	7.0
Chester, Ill	1,189	36	19.7	19	13.3	30	16.6	6.4
New Madrid, Mo	1,003	34	33.8	30	24.2	1	30.1	9.6
Memphis, Tenn	843	33	30.5	30	20.6	1	27.0	9.9
Helena, Ark	767	42	39.1	30	29.1	2	35.5	10.0
Arkansas City, Ark	635	42	41.4	30	32.4	3, 4	37.5	9.0
Greenville, Miss	595	42	35.6	30	27.7	4	32.1	7.9
Vicksburg, Miss	474	45	39.9	30	31.2	5, 6	35.4	8.7
New Orleans, La	108	16	13.7	28	10.8	6, 7	12.2	2.9
Missouri River.								
Bismarck, N. Dak	1,309	14	8.2	2	1.5	23-25	2.6	6.7
Pierre, S. Dak	1,114	14	8.3	4	2.6	25, 26, 29, 30	3.9	5.7
Sioux City, Iowa	784	19	10.7	7	5.9	1-3	6.5	4.8
Omaha, Nebr	669	18	10.1	9	6.3	6	7.4	3.8
Plattsmouth, Nebr	641	18	7.0	8	3.7	29, 30	4.8	3.3
St. Joseph, Mo	481	10	6.2	9	2.3	29, 30	3.4	3.9
Kansas City, Mo	388	21	16.5	15	9.3	30	12.4	7.2
Boonville, Mo	199	20	14.8	16	7.1	3	10.7	7.7
Hermann, Mo	103	24	15.5	17, 18	8.0	30	11.9	7.5
Osage River.								
Bagnell, Mo	70	28	11.4	16	3.3	30	8.0	8.1
Des Moines River.								
Des Moines, Iowa	165	19	7.8	1	5.4	26-30	6.3	2.4
Illinois River.								
Peoria, Ill	135	14	17.6	1	11.1	30	14.3	6.5
Beardstown, Ill	70	12	9.8	11	5.0	30	8.0	4.8
Youghiogheny River.								
Confluence, Pa	59	10	10.5	7	2.1	2	4.4	8.4
West Newton, Pa	15	23	14.3	7	2.2	2	5.4	12.1
Allegheny River.								
Warren, Pa	177	14	10.0	23, 24	3.2	4, 19	5.6	6.8
Oil City, Pa	123	13	11.0	22	3.7	19	6.1	7.3
Parker, Pa	73	20	12.0	21-23	3.9	18, 19	7.1	8.1
Monongahela River.								
Weston, W. Va	161	18	11.2	4	0.0	1, 2, 12, 13, 30	2.0	11.2
Fairmont, W. Va	119	25	14.5	4	1.6	14	6.7	12.9
Greensboro, Pa	81	18	18.7	20	8.5	2	12.2	10.2
Lock No. 4, Pa	40	28	25.5	21	8.7	2	15.2	16.8
Conemaugh River.								
Johnstown, Pa	64	7	9.6	7	2.6	30	3.9	7.0
Red Bank Creek.								
Brookville, Pa	35	8	5.7	20	1.2	30	2.6	4.5
Beaver River.								
Ellwood Junction, Pa	10	14	11.0	21	3.4	14-19	5.4	7.6
Great Kanawha River.								
Charleston, W. Va	61	30	36.4	22	6.1	2	13.8	30.3
Little Kanawha River.								
Glenville, W. Va	100	20	24.3	4	1.5	11	4.7	22.8
New River.								
Hinton, W. Va	95	14	18.0	21	3.2	1, 2, 13	5.6	14.8
Cheat River.								
Rowlesburg, W. Va	36	14	9.0	7	3.5	3	5.7	5.5
Ohio River.								
Pittsburg, Pa	966	22	27.4	21	7.5	3	13.4	19.9
Davis Island Dam, Pa	960	25	25.8	21	8.6	3	13.5	17.2
Wheeling, W. Va	875	36	41.3	22	11.3	3	20.9	30.0
Parkersburg, W. Va	785	36	43.9	23	12.0	15	24.8	31.9
Point Pleasant, W. Va	703	39	53.0	24	16.2	15	32.5	36.8
Huntington, W. Va	660	50	57.4	25	20.9	15	37.1	36.5
Catlettsburg, Ky	651	50	59.1	25	21.2	15	38.1	37.9
Portsmouth, Ohio	612	50	58.4	26	21.4	16	28.2	37.0
Cincinnati, Ohio	499	50	59.7	27	23.9	17	39.5	35.8
Madison, Ind	413	46	49.9	28	20.4	18	32.8	29.5
Louisville, Ky	367	28	33.3	29	9.5	18	16.5	23.8
Evansville, Ind	184	35	41.8	30	20.9	1	29.2	20.9
Paducah, Ky	47	40	39.3	30	22.2	1	30.2	17.1
Cairo, Ill	1,073	45	43.0	30	29.8	1	37.3	13.2
Muskingum River.								
Zanesville, Ohio	70	20	24.3	27	7.1	16-18	12.7	17.2
Scioto River.								
Columbus, Ohio	110	17	3.6	24	1.9	16-18	2.6	1.7
Miami River.								
Dayton, Ohio	69	18	3.4	23	1.0	11, 12	2.0	2.4
Wabash River.								
Mount Carmel, Ill	50	15	13.5	23	5.9	17	9.8	7.6
Licking River.								
Falmouth, Ky	30	25	20.2	20	1.5	2, 3	6.9	18.7
Kentucky River.								
Frankfort, Ky	40	31	25.1	23	7.2	14, 15	12.0	17.9
Clinch River.								
Speers Ferry, Va	156	20	9.9	21	1.2	13	3.9	8.7
Clinton, Tenn	46	25	19.2	22	7.5	13	12.7	11.7
Tennessee River.								
Knoxville, Tenn	614	29	17.1	4	4.0	13	8.5	13.1
Kingston, Tenn	534	25	15.2	4	4.8	13	9.4	10.4

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Tennessee River—Cont'd.	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
Chattanooga, Tenn	430	33	26.5	21	6.8	14	15.5	19.7
Bridgeport, Ala	390	24	20.0	22	6.2	13	12.5	13.8
Florence, Ala	220	16	16.3	23	6.4	15	12.3	9.9
Riverton, Ala	190	25	25.3	25	8.7	15	18.6	16.6
Johnsonville, Tenn	94	24	24.7	27	10.4	17	19.4	14.3
Cumberland River.								
Burnside, Ky	434	50	52.0	20	5.6	13	16.9	46.4
Carthage, Tenn	257	40	38.3	22	6.8	13	19.3	31.5
Nashville, Tenn	175	40	37.8	25	10.4	13	23.8	27.4
Clarksville, Tenn	138	42	41.2	26	14.3	1	27.6	26.9
Arkansas River.								
Wichita, Kans	726	10	6.0	13	1.9	1	3.1	4.1
Webbers Falls, Ind. T	413	23	12.5	18	4.7	30	7.9	7.8
Fort Smith, Ark	351	22	14.7	19	4.1	1	9.2	10.6
Dardanelle, Ark	256	21	16.0	19	4.6	1	9.5	11.4
Little Rock, Ark	176	23	17.9	20	7.6	3	11.5	10.3
White River.								
Newport, Ark	150	26	22.0	23	8.5	1	14.1	13.5
Yazoo River.								
Yazoo City, Miss	80	25	16.6	28-30	12.8	17	15.0	3.8
Red River.								
Arthur City, Tex	688	27	8.8	19	4.0	10	5.3	4.8
Fulton, Ark	565	28	19.0	22	8.5	11, 30	13.6	10.5
Shreveport, La	449	29	14.0	24, 25	8.0	14	11.1	6.0
Alexandria, La	139	33	14.6	27	7.4	17	11.4	7.2
Ouachita River.								
Camden, Ark	340	39	33.8	23	9.4	12	21.6	24.4
Monroe, La	100	40	22.8	1, 30	18.0	18	20.5	4.8
Atchafalaya River.								
Melville, La	100	31	31.2	30	28.4	7, 8	29.6	2.8
Susquehanna River.								
Wilkesbarre, Pa	178	14	14.4	8	3.9	20	7.9	10.5
Harrisburg, Pa	70	17	13.6	23	4.8	20	8.0	8.8
W. Br. of Susquehanna.								
Williamsport, Pa	35	20	15.2	22	4.0	20	7.3	11.2
Juniata River.								
Huntingdon, Pa	80	24	8.5	21	4.0	1-3, 19, 30	5.5	4.5
Potomac River.								
Harpers Ferry, W. Va	170	16	19.5	22	2.6	2, 3	6.6	16.9
James River.								
Lynchburg, Va	257	18	13.2	21	2.0	1, 2, 13	6.6	11.2
Richmond, Va	110	12	13.4	23	0.2	14	4.0	13.2
Roanoke River.								
Weldon, N. C	90	40	37.7	6	9.5	14	17.8	28.2
Cape Fear River.								
Fayetteville, N. C	100	38	47.7	5	6.0	13	15.5	41.7
Edisto River.								
Edisto, S. C	75	6	5.9	24, 25	4.8	17, 18	5.3	1.1
Pedee River.								
Cheraw, S. C	145	27	33.5	4	3.8	13	15.1	29.7
Black River.								
Kingstree, S. C	60	12	10.1	7, 8	6.7	21	8.1	3.4
Lynch Creek.								
Effingham, S. C	35	12	14.8	25, 26	7.1	17	10.8	7.7
Santee River.								
St. Stephens, S. C	50	12	15.0	11	7.7	1, 19	10.8	7.3
Congaree River.								
Columbia, S. C	37	15	22.0	4	0.7	11	5.9	21.3
Wateree River.								
Camden, S. C	45	24	31.1	22	7.7	13	15.8	23.4
Waccamaw River.								
Conway, S. C	40	7	6.5	15, 16	5.0	29, 30	5.9	1.5
Savannah River.								
Calhoun Falls, S. C	347	......	11.5	3	3.8	11-13, 27, 30	5.1	7.7
Augusta, Ga	268	32	31.7	4	10.2	12	15.5	21.5
Broad River.								
Carlton, Ga	30	......	12.5	3	2.8	30	4.1	9.7
Flint River.								
Albany, Ga	80	20	21.8	5	5.3	30	15.0	16.5
Chattahoochee River.								
Westpoint, Ga	239	20	10.6	14	3.8	12	6.1	6.8
Ocmulgee River.								
Macon, Ga	125	20	18.8	3	4.3	30	8.1	14.5
Oconee River.								
Dublin, Ga	60	30	22.6	6	3.8	29, 30	10.0	18.8
Coosa River.								
Rome, Ga	225	30	18.6	20	4.1	30	8.4	14.5
Gadsden, Ala	144	18	22.0	21	5.0	13	11.9	17.0
Alabama River.								
Montgomery, Ala	265	35	37.4	3	9.0	13	22.5	28.4
Selma, Ala	212	35	39.0	23	11.8	14	27.1	27.2
Tombigbee River.								
Columbus, Miss	303	33	13.5	22, 23	0.7	13, 14	5.4	12.8
Demopolis, Ala	155	35	40.7	25	13.0	17	28.3	27.7
Black Warrior River.								
Tuscaloosa, Ala	129	43	42.6	21	10.0	13	22.1	32.6
Brazos River.								
Kopperl, Tex	369	21	1.8	3	— 0.2	2	0.7	2.0
Waco, Tex	301	22	2.6	5, 6	1.9	1-4	2.0	0.7
Columbia River.								
Umatilla, Oreg	270	25	8.4	28	5.0	8	6.4	3.4
The Dalles, Oreg	166	40	13.1	28	7.6	6, 7	9.8	5.5
Willamette River.								
Albany, Oreg	99	20	9.2	8	4.0	29, 30	6.3	5.2
Portland, Oreg	10	15	8.8	7	5.7	14	7.0	3.1
Sacramento River.								
Red Bluff, Cal	241	23	6.5	30	3.2	24-27	3.6	3.8
Sacramento, Cal	70	29	21.0	1	19.1	18-22	19.8	1.9

Chart I. Tracks of Centers of High Areas. April, 1901.

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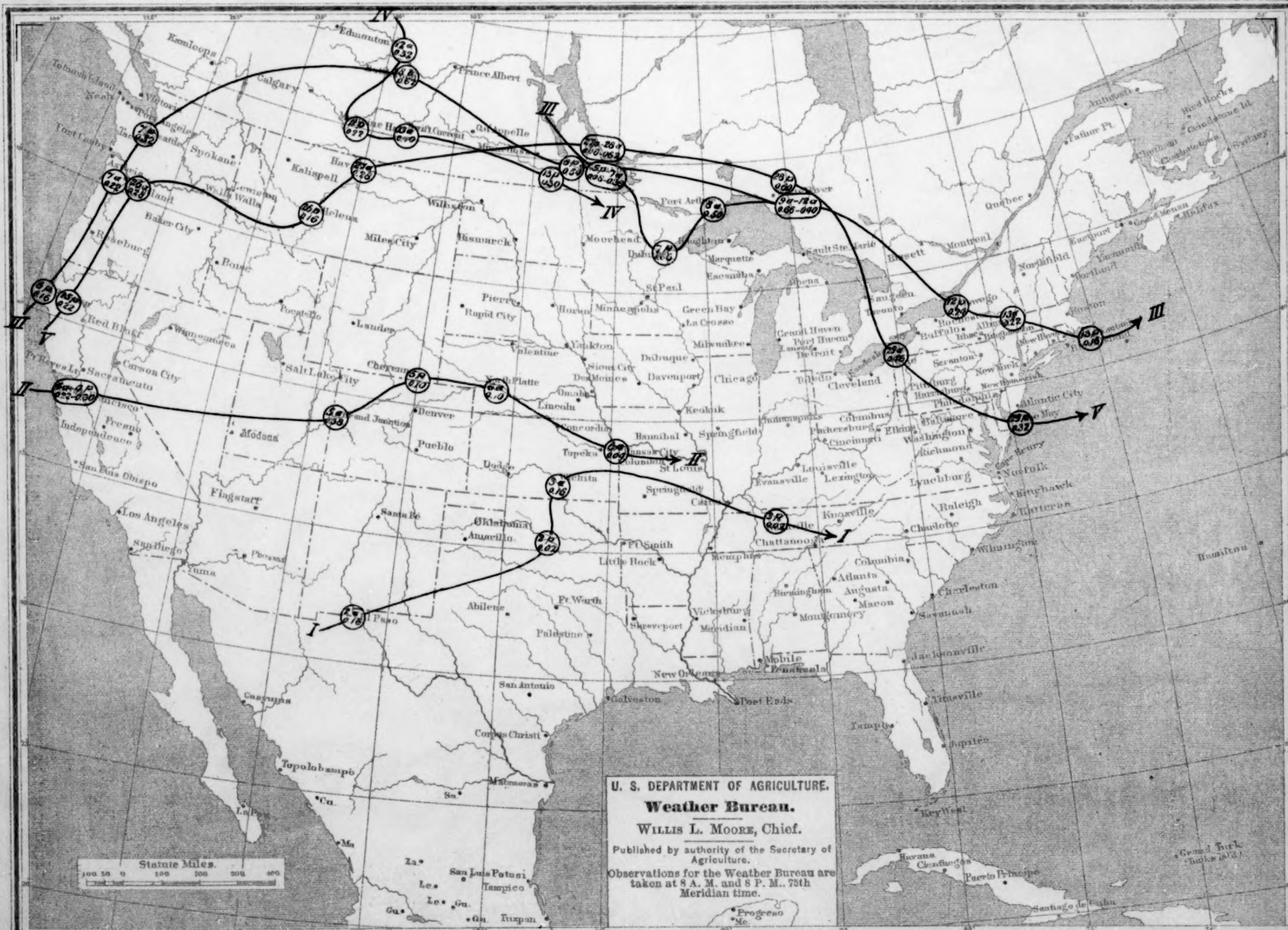


Chart II. Tracks of Centers of Low Areas. April, 1901.

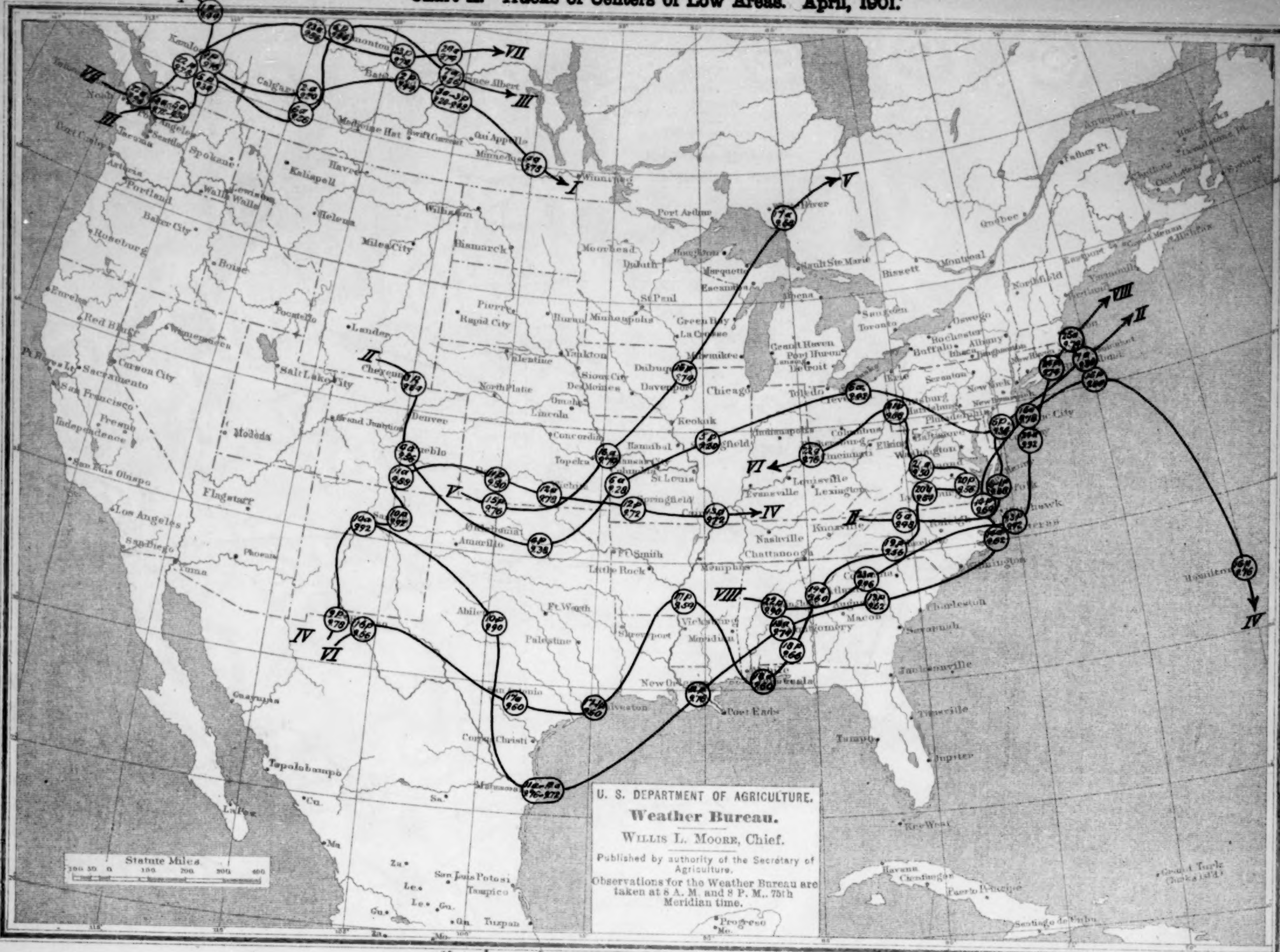


Chart III. Total Precipitation. April, 1901.

Chart III. Total Precipitation. April, 1901.

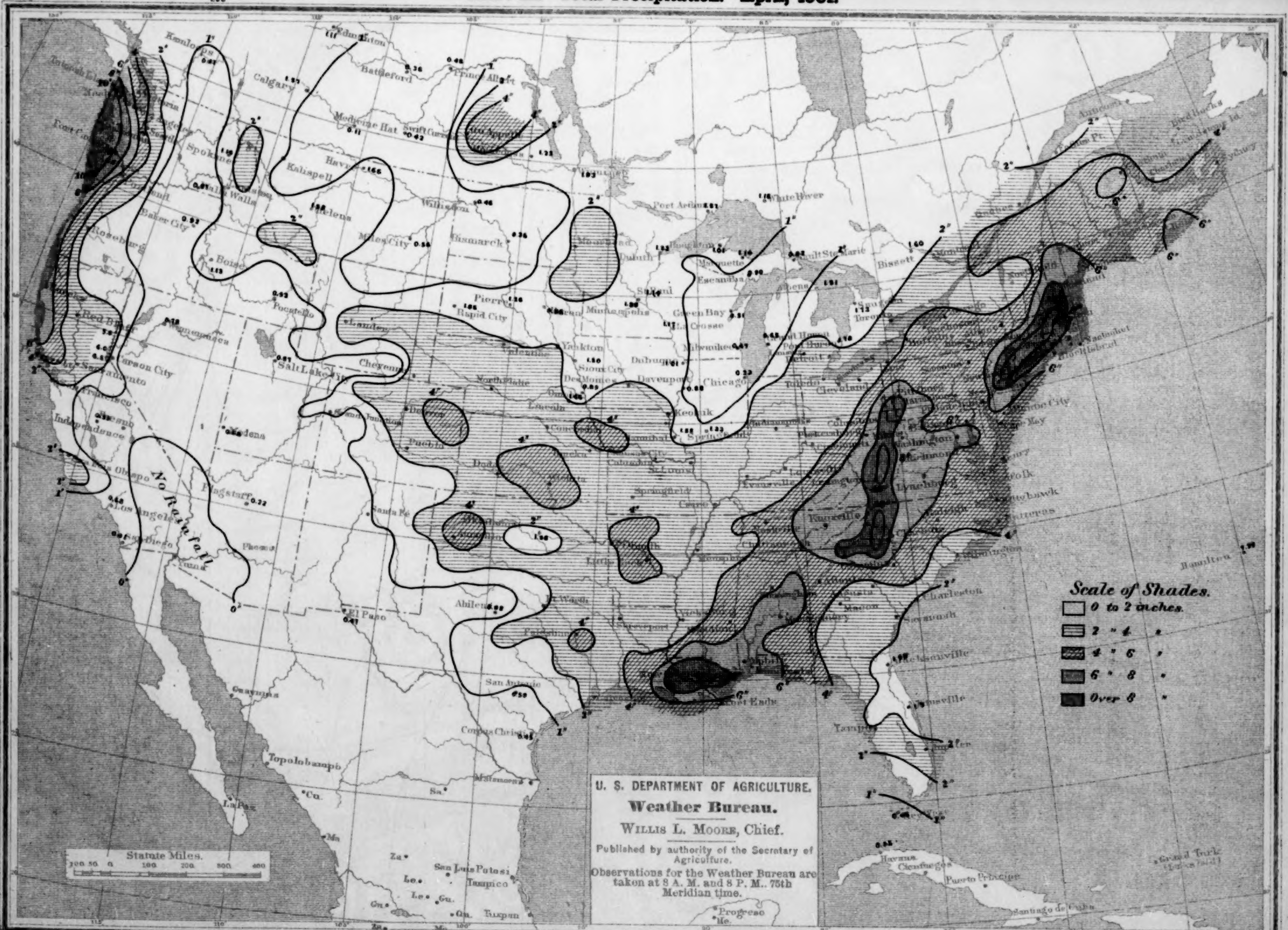


Chart IV. Sea-Level Pressure and Temperature; Resultant Surface Winds. April, 1901.

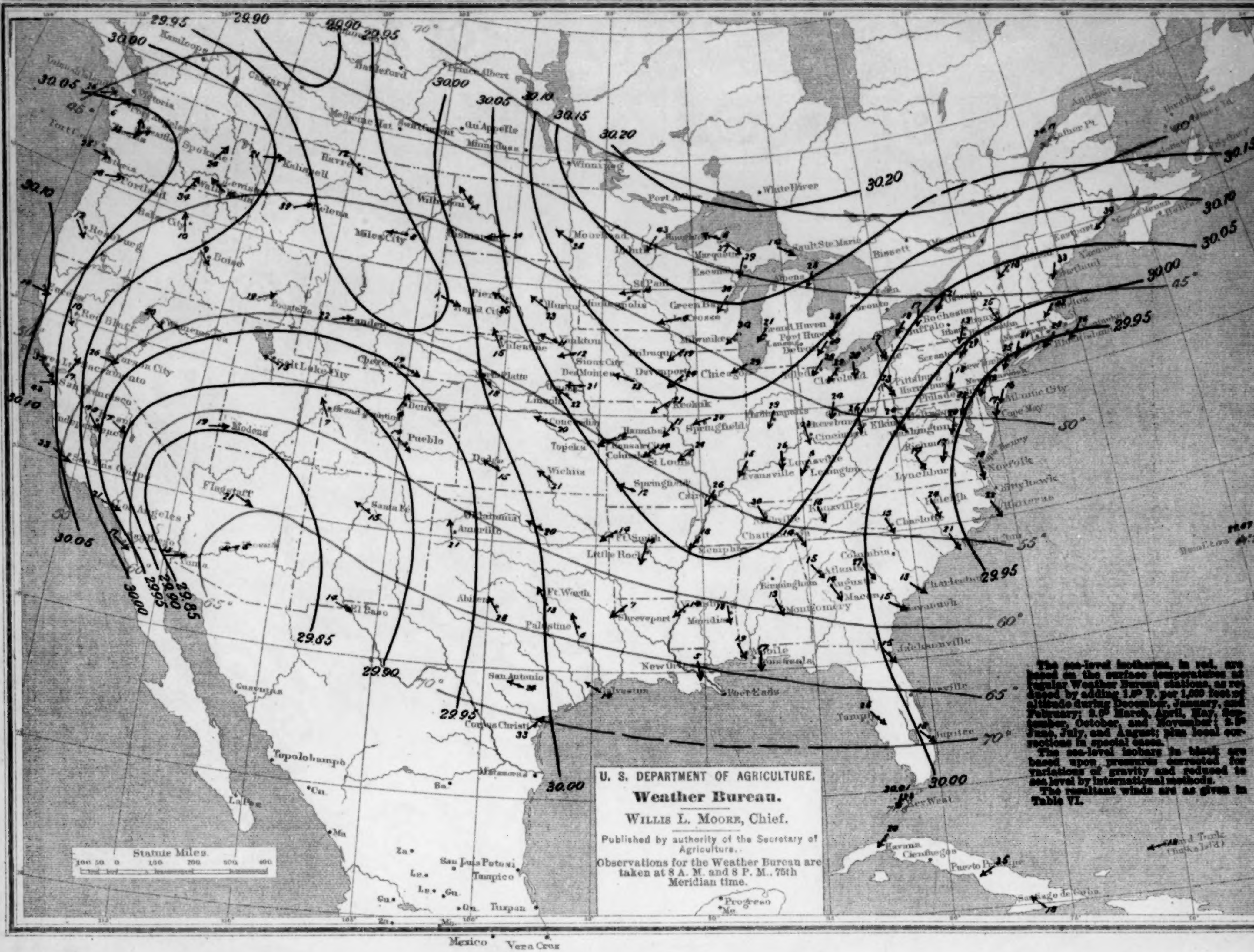


Chart V. Hydrographs for Seven Principal Rivers of the United States. April, 1901.

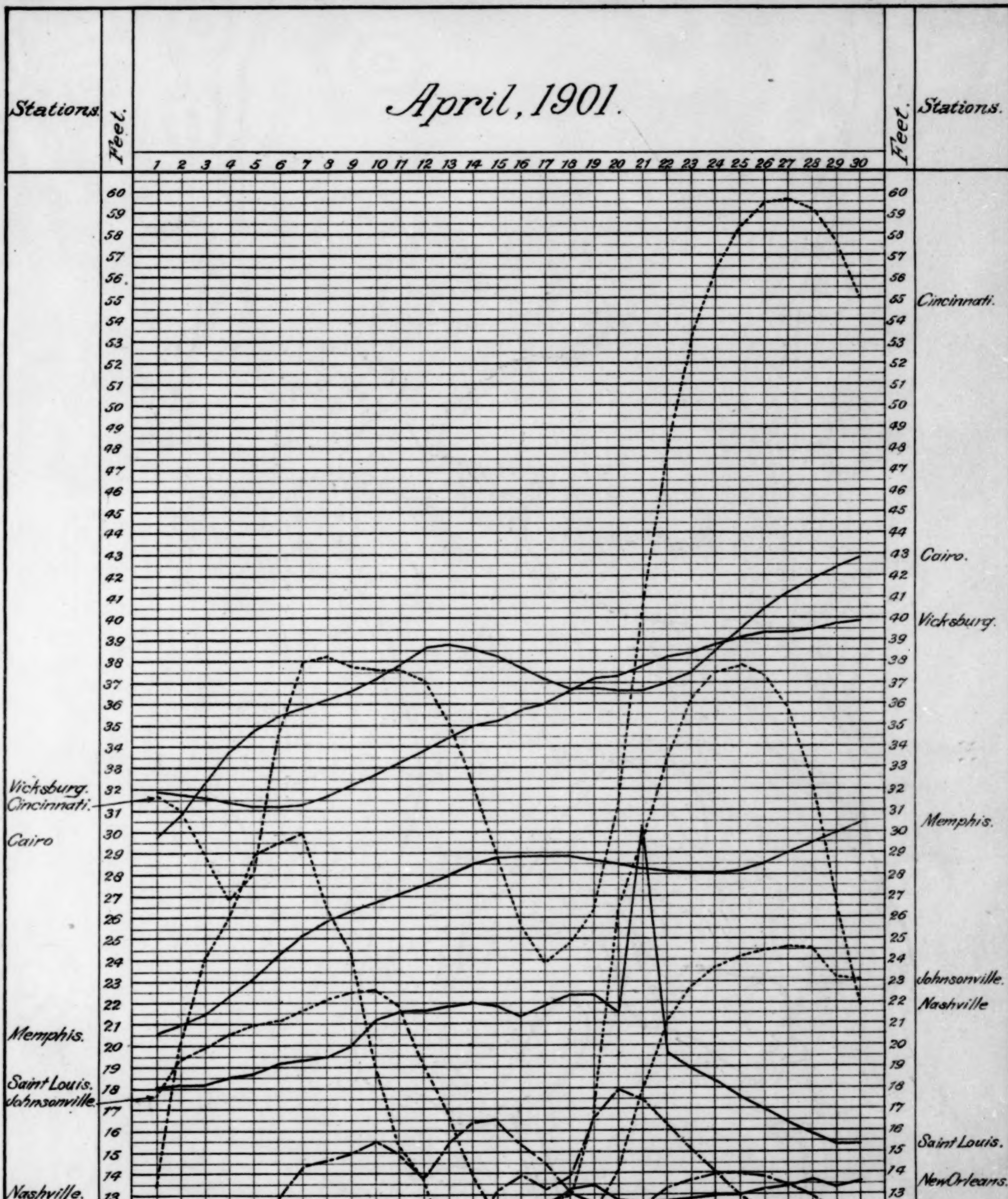


Chart VI. Surface Temperatures; Maximum, Minimum, and Mean. April, 1901.

Chart VII. Percentage of Sunshine. April, 1901.

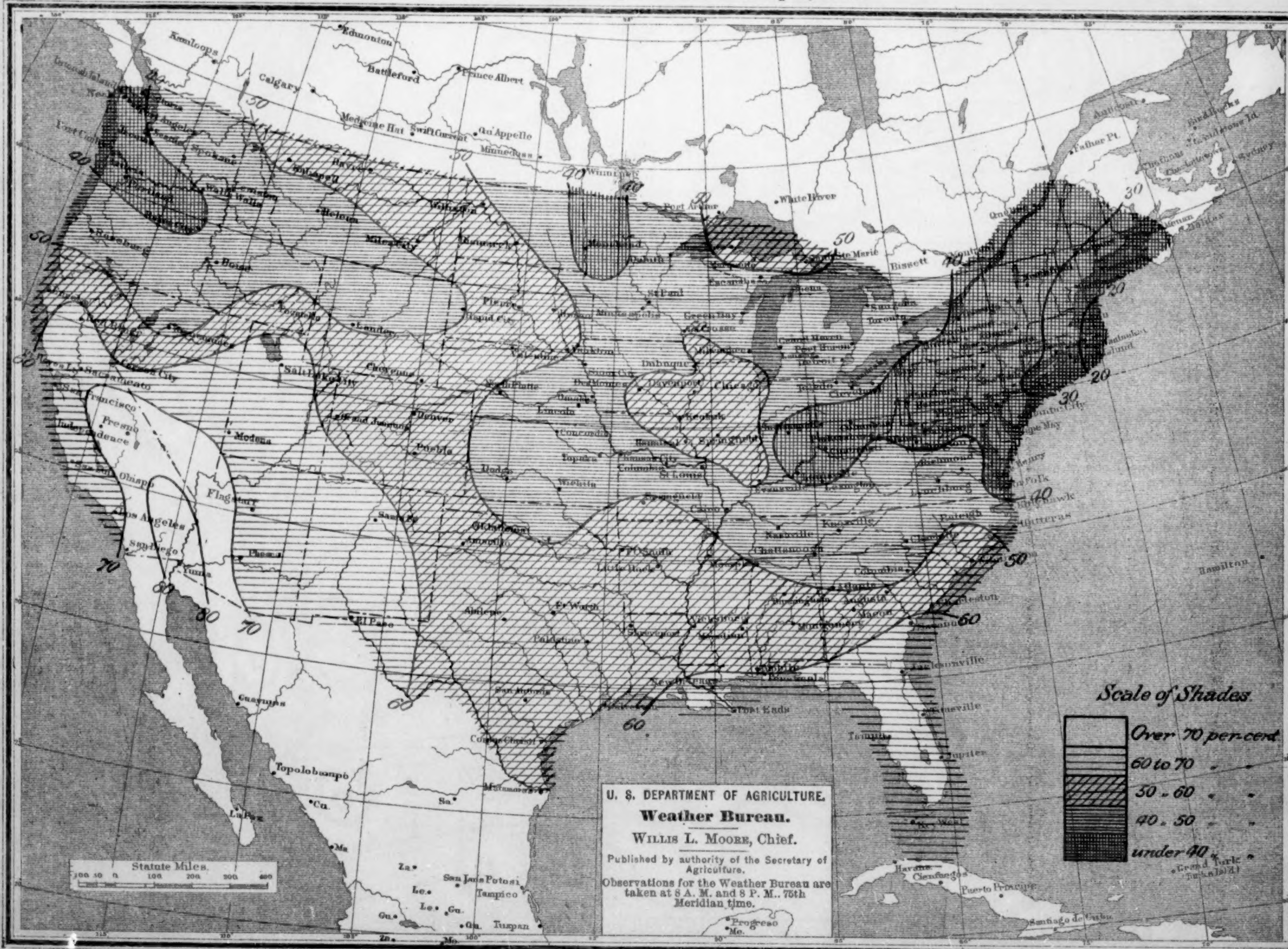
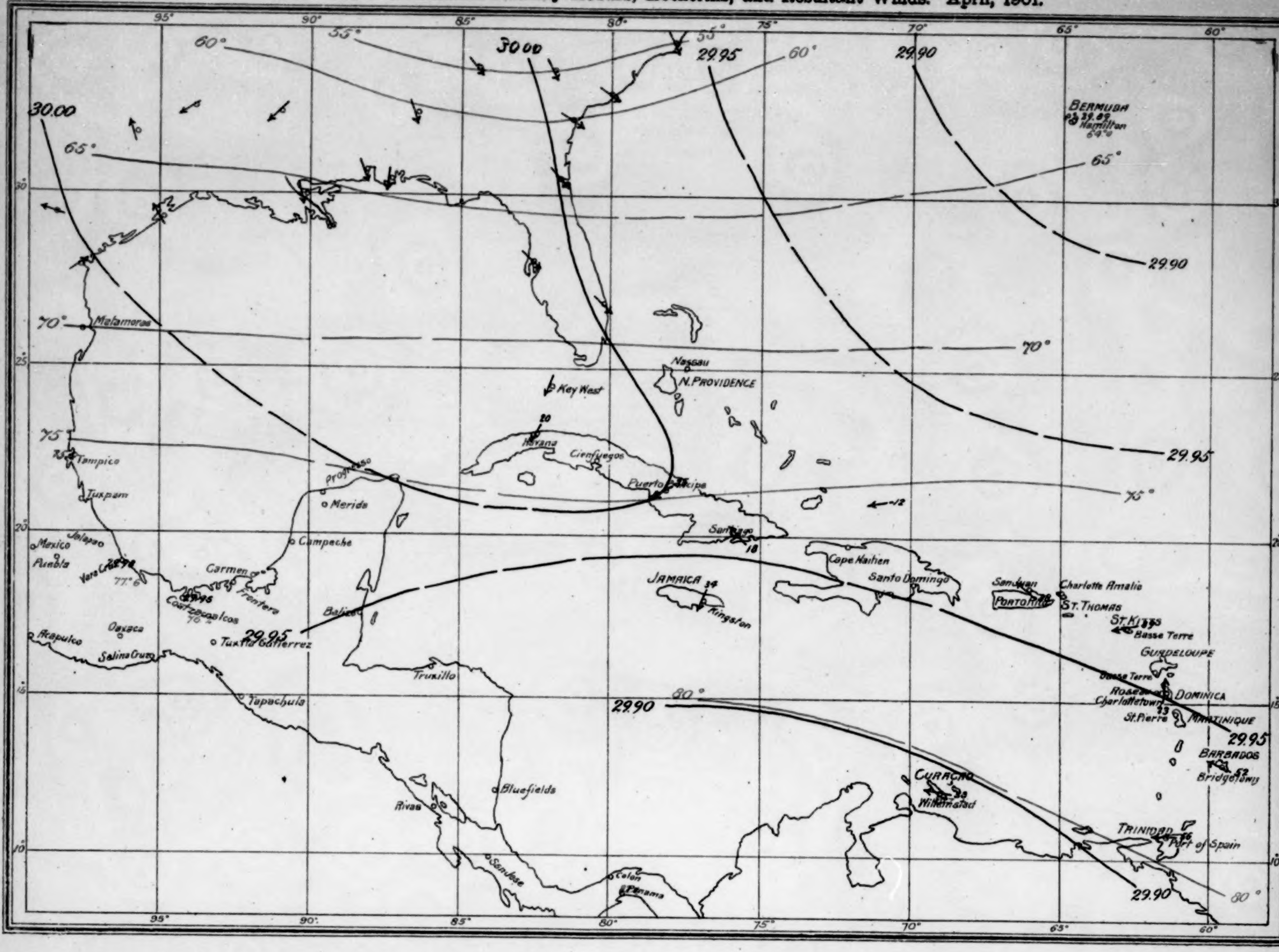


Chart VIII. West Indian Monthly Isobars, Isotherms, and Resultant Winds. April, 1901.



XXIX—49.

• Barkerville

Chart IX. Total Snowfall for April, 1901.

Chart IX. Total Snowfall for April, 1901.